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CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE SOUTH PLAINFIELD, NEW JERSEY

OPERABLE UNIT 4: BOUND BROOK

FINAL REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

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Prepared By:

The Louis Berger Group, Inc.

And

Malcolm Pirnie, Inc.

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1. INTRODUCTION

1.1. OVERVIEW

The Cornell-Dubilier Electronics (CDE) Superfund Site (Site) is located at 333 Hamilton Boulevard, South Plainfield, Middlesex County, New Jersey. The Site has been divided into four Operable Units by the United States Environmental Protection Agency (USEPA). Operable Unit 1 (OU1) addresses residential, commercial, and municipal properties near the former CDE facility. On September 30, 2003, the USEPA signed a Record of Decision (ROD) to address OU1. Operable Unit 2 (OU2) addresses contaminated soils and buildings at the former CDE facility. On September 30, 2004, the USEPA signed a ROD to address OU2. Operable Unit 3 (OU3) addresses contaminated groundwater, a ROD has not yet been signed for OU3. Operable Unit 4 (OU4) addresses contamination in Bound Brook, which is a major tributary of Green Brook (a tributary of the Raritan River) in Middlesex County, New Jersey and is classified as freshwater, non-tidal (Figure 1-1). The Bound Brook headwater is located in Edison Township, New Jersey and flows westerly through South Plainfield Borough into Piscataway Township, where the water is dammed to form New Market Pond. The brook then flows through Middlesex Borough to the confluence with Green Brook.

The OU4 Investigation Area (hereafter referred to as OU4) combines the Bound Brook channel with the 100-year floodplain as shown on Figure 1-2. [The floodplain boundaries were developed by the Federal Emergency Management Agency (FEMA).] The downstream extent of OU4 is the confluence of Bound Brook with Green Brook. For the purposes of this OU4, USEPA has determined that the 2007 samples (identified as

BD-5 and BD-6) taken as part of the Woodbrook Road Dump Superfund Site[1] Investigation be considered as the end of Woodbrook Road and the upstream OU4 boundary (TRC, October 2007).

The former CDE facility, also known as the Hamilton Industrial Park, consists of approximately 26 acres. CDE manufactured electronic components including, in particular, capacitors from 1936 to 1962. Polychlorinated biphenyls (PCB) and chlorinated organic solvents were used in the manufacturing process. It is believed that CDE disposed of PCB-contaminated materials and other hazardous substances directly on the OU2 soils. These activities evidently led to widespread chemical contamination at the former CDE facility, as well as migration of contaminants to areas nearby. Elevated volatile organic compounds (VOC) and PCB concentrations have been reported in soils at the former CDE facility, in soils at adjacent properties (residential, commercial, and municipal), in groundwater beneath the former CDE facility, and in the sediments of Bound Brook. Summaries of previous investigations are presented in Section 2.2.3.

The Remedial Investigation/Feasibility Study (RI/FS) for OU4, described in this Work Plan, is designed to collect data to define the nature and extent of sediment and floodplain soil contamination, to assess contaminant fate and transport, to identify migration pathways, to perform an assessment of human and ecological health risks, and to evaluate potential remedial alternatives for sediment, soil, and surface water. These data may be used to support the selection of remedial alternatives to potentially mitigate or reduce risks in accordance with the requirements of the National Contingency Plan (NCP) and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

[1] OU4 does not include *the Woodbrook* Road Dump Superfund Site (NJSFW0204260), which is an inactive and dumping area that operated during the 1940s and 1950s. Household and industrial wastes were accepted until the dump was shut down by the State of New Jersey in 1958.

1.2. APPROACH TO DEVELOPMENT OF WORK PLAN

This Work Plan presents the proposed technical scope of work and schedule for the performance of the RI/FS. The Work Plan was prepared according to the current USEPA guidance including, but not limited to, the following documents:

- Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final. EPA/540/G89/004. OSWER Directive 9355.3-01 (USEPA, 1988a).
- Contaminated Sediment Remediation Guidance for Hazardous Waste Sites. EPA-540-R-05-012. OSWER 9355.0-85 (USEPA, 2005a).
- CERCLA Compliance with Other Laws Manual, Interim Final. EPA/540-9-89-006 (USEPA, 1988b).
- Contract Laboratory Program Guidance for Field Samplers, OSWER 9240.0-44, EPA/540-R-07-06 (USEPA, 2007).
- Guidance for the Data Quality Objectives Process, EQA/G-4, EPA/600/R-96/005 (USEPA, 2000a).
- Uniform Federal Policy for Quality Assurance Project Plans, Part 1: UFP-QAPP Manual, EPA-505-B-04-900A, Final Version 1 (USEPA, 2005b).
- Uniform Federal Policy for Quality Assurance Project Plans, Part 2A: UFP-QAPP Workbook, EPA-505-B-04-900C, Final Version 1 (USEPA, 2005c).
- Uniform Federal Policy For Quality Assurance Project Plans, Part 2B: Quality Assurance/Quality Control Compendium: Minimum QA/QC Activities, EPA-505-B-04-900B, Final Version 1 (USEPA, 2005d).

- Guide for Conducting Treatability Studies Under CERCLA, Interim Final. EPA/540/2-89/058 (USEPA 1989a).

- Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual Part A (USEPA, 1989b).

- Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments) (USEPA, 2001a).

- Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) (USEPA, 2004).

- Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (USEPA, 1997a).

In addition, preparation of this Work Plan was based upon review and consideration of data, information, and discussions related to the following:

- Data Evaluation Report for Cornell-Dubilier Electronics Superfund Site. South Plainfield, Middlesex County, New Jersey [Foster Wheeler Environmental Corporation (FWENC), 2001a].

- Remedial Investigation Report for OU1, Cornell-Dubilier Electronics Superfund Site. South Plainfield, Middlesex County, New Jersey (FWENC, 2001b).

- Final Report, Ecological Evaluation for the Cornell Dubilier Electronics Site (USEPA, 1999a).

- Preliminary Assessment and Site Investigation, Spring Lake PCB Contamination (NJDEP, 1999).

- Soil and Sediment Sampling and Analysis Summary Report (USEPA, 1998a) and Addendum No. 1 (USEPA, 1999b).

- Floodplain Soil/Sediment Sampling and Analysis Summary Report (Weston, 2000).

- Preliminary Conceptual Site Model for Operable Unit 4 of the Cornell-Dubilier Electronics Superfund Site (Tetra Tech EC Inc., May 2006).

- Sampling Report, Cornell-Dubilier Electronics Site for Sample Dates December 2007 and January 2008 (USEPA, 2008a).

- Wildlife Species Investigation of the Bound Brook Ecosystem, South Plainfield, New Jersey (Stantec, 2008).

- OU4 project kick-off meeting with the United States Army Corps of Engineers (USACE) Kansas City and New York Districts and the USEPA on October 15, 2008.

- OU4 scoping meeting with USACE, USEPA, and other stakeholder agencies on January 22, 2009.

- Final Report Cornell-Dubilier Bound Brook Reassessment, South Plainfield, New Jersey (USEPA, 2010).

1.3. WORK PLAN CONTENT

This Work Plan is organized into nine sections, including references and a glossary of abbreviations. A brief description of each section follows.

Section 1.0, **INTRODUCTION**, presents a brief overview of the environmental conditions at the site, the approach used in developing the Work Plan, the scope of work, and the organization and content of the Work Plan.

Section 2.0, **SITE BACKGROUND AND SETTING**, presents the background of the site including location, history, summaries of prior environmental investigations, and current conditions.

Section 3.0, **INITIAL EVALUATION**, presents an initial evaluation of the existing data. This section includes a description of the types of contaminants present, site hydrology and hydrogeology, climate, population, and environmental resources, migration and exposure pathways, a preliminary identification of applicable or relevant and appropriate requirements (ARARs), a preliminary risk assessment, a summary of additional data requirements, and preliminary remedial action objectives.

Section 4.0, **WORK PLAN RATIONALE**, references the Data Quality Objectives (DQOs) for RI sampling and analytical activities, and the approach for preparing the Work Plan, which illustrates how the activities will satisfy data needs.

Section 5.0, **RI/FS TASKS**, presents a proposed scope for each task of the RI/FS.

Section 6.0, **PROJECT SCHEDULE**, presents the anticipated schedule for the RI/FS tasks.

Section 7.0, **PROJECT MANAGEMENT APPROACH**, presents project management considerations that define relationships and responsibilities for selected task and project management teams.

Section 8.0, **REFERENCES**, provides a list of references used to develop material presented in this Work Plan.

Section 9.0, **GLOSSARY OF ABBREVIATIONS**, provides a glossary of abbreviations and acronyms used in this Work Plan.

2. SITE BACKGROUND AND SETTING

2.1. SITE LOCATION

Bound Brook is a major tributary of Green Brook (a tributary of the Raritan River) in Middlesex County, New Jersey and is classified as freshwater, non-tidal. The Bound Brook headwater is located in Edison Township, New Jersey and flows westerly through South Plainfield Borough into Piscataway Township, where the water is dammed to form New Market Pond .

OU4 combines the Bound Brook channel with the 100-year floodplain as shown on Figure 1-2. The downstream extent of OU4 is the confluence of Bound Brook with Green Brook. The upstream extent of OU4 shall be defined by the location of samples BD-5 and BD-6 collected in 2007 from the adjacent Woodbrook Road Dump Superfund Site[2] (TRC, October 2007). OU4 encompasses approximately 1.84 square miles (approximately 1,200 acres) and extends approximately 7.5 miles from the confluence of Bound Brook and Green Brook to the northwestern limit of the sampling associated with the Woodbrook Road Dump Site. A River Mile (RM) system was developed for OU4, with RM0 placed at the confluence of Bound Brook and Green Brook.

OU4 also includes portions of Cedar Brook and three unnamed tributaries to Bound Brook. The northern extent of OU4 on Cedar Brook is Cedar Brook Avenue (South Plainfield, New Jersey). The scope of the investigation of the unnamed tributaries, their floodplains, and the floodplain proximal to Green Brook (dashed line in Figure 1-2) will be contingent on decision criteria and data evaluation described in Sections 5.3.8, 5.3.9, and 5.3.13.

[2] OU4 does not include the Woodbrook Road Dump Superfund Site (NJSFW0204260), which is an inactive and dumping area that operated during the 1940s and 1950s. Household and industrial wastes were accepted until the dump was shut down by the State of New Jersey in 1958.

The former CDE facility is located at approximately RM6.5. This fenced, 26-acre facility is bounded on the northeast by Bound Brook and the former Lehigh Valley Railroad, Perth Amboy Branch (presently Conrail); on the southeast by Bound Brook and a property used by the South Plainfield Department of Public Works; on the southwest, across Spicer Avenue, by single family residential properties; and to the northwest, across Hamilton Boulevard, by mixed residential and commercial properties. The surrounding area represents an urban environment with principally commercial and light industrial use to the northeast and east, principally residential development to the south and directly north, and mixed residential and commercial properties to the west. The former CDE facility contained numerous subdivided buildings, numbered 1 through 18; demolition of these buildings was completed in 2008. A topographic map showing the location of the former CDE facility is included as Figure 2-1 and a plan view of the facility, showing the former buildings, is included as Figure 2-2.

2.2. SITE HISTORY

2.2.1. Operations at the Former CDE Facility

The history of the former CDE facility and previous investigations/enforcement activities that have occurred at the CDE Superfund Site are summarized below. Previous investigations included groundwater sampling, surface and subsurface soil sampling, sediment sampling, building surface sampling, soil gas sampling, indoor air sampling, surface water sampling, biota sampling, and hydrogeological studies.

The Spicer Manufacturing Company operated a manufacturing plant on the OU2 property from 1912 to 1929 (referred to hereafter as the South Plainfield plant). The Spicer Manufacturing Company manufactured universal joints and drive shafts, clutches, drop forgings, sheet metal stampings, screw products, and coil springs for the automobile industry. The South Plainfield plant included a machine shop, box shop, lumber shop, scrap shop, heat treating building, transformer platform, forge shop, shear shed, boiler room, acid pickle building, and die sinking shop. A chemical laboratory for the analysis of steel was added in 1917. Most of the major structures were erected by 1918; Figure 2-2 shows the locations of the former buildings, which were demolished by 2008. In 1929, the Spicer Manufacturing Company ceased operations at the South Plainfield plant, which then consisted of approximately 210,000 square feet of buildings (FWENC, 2002).

On April 1, 1929, the Spicer Manufacturing Corporation transferred all remaining assets of the South Plainfield plant to a new subsidiary, the Plainfield Manufacturing Corporation. The Plainfield Manufacturing Corporation apparently served as a holding company for the South Plainfield plant and property, portions of which it soon was beginning to lease to other companies. While documentary evidence exists indicating that Spicer Manufacturing Company intended to maintain a large and active business via the Plainfield Manufacturing Company, this apparently did not come to pass, likely due to the 1929 stock market crash and the ensuing depression. Regardless of the intentions of the company, by the end of 1929, company headquarters and practically all of its manufacturing equipment had been moved from South Plainfield to a new Toledo, Ohio facility. The South Plainfield plant was largely inactive until 1936, when it was leased to CDE. In 1946, the Spicer Manufacturing Corporation officially changed its name to The Dana Corporation (Malcolm Pirnie, 2006).

CDE operated at what is now known as the Hamilton Industrial Park from 1936 to 1962, manufacturing electronic components including capacitors. It has been reported that the company also tested transformer oils for an unknown period of time. PCB and chlorinated organic degreasing solvents were used in the manufacturing process, and it has been alleged that during CDE’s period of operation, the company disposed of PCB-contaminated materials and other hazardous substances at the facility. A former employee has claimed that the rear of the OU2 property was saturated with transformer oils and that capacitors were buried behind the former CDE facility during the same time period (FWENC, 2002). Following CDE's departure in 1962, the Hamilton Industrial Park operated as a rental property consisting of commercial and light industrial tenants. Since the early 1960s, numerous tenants have occupied the complex. In 2007, the USEPA began implementing the OU2 ROD with the relocation of the tenants at the industrial park and demolition of the 18 buildings. Relocation of the tenants was completed in mid-2007 and demolition of buildings was completed in May 2008.

2.2.2. Previous Investigations/Enforcement Actions at OU1 through OU3

Environmental conditions at the former CDE facility were first investigated by the New Jersey Department of Environmental Protection (NJDEP) in 1986. Subsequent sampling by NJDEP and USEPA detected the presence of elevated concentrations of PCB, VOC, and inorganic chemicals at the former CDE facility. In 1997, the USEPA conducted a preliminary investigation of Bound Brook (refer to Section 2.2.3.1) and collected surface soil and interior dust samples from nearby residential and commercial properties. The results of these investigations led to fish consumption advisories for Bound Brook and its tributaries, and the Site was added to the National Priority List (NPL) in July 1998. In addition, the USEPA ordered several removal actions to be performed at OU1:

- In March 1997, USEPA ordered the owner of the former CDE facility, D.S.C. of Newark Enterprises, Inc. (DSC), to perform a removal action to mitigate risks associated with contaminated soil and surface water runoff from the former CDE facility.

- In 1998, USEPA initiated a removal action to address PCB contamination in interior dust at houses to the west and southwest of the former CDE facility.

- In 1998, USEPA ordered CDE and the Dana Corporation to implement a removal action to address PCB contamination in soils at six residential properties located to the west and southwest of the former CDE facility. This removal action was conducted by CDE from 1998 to 1999.

- In 1999, USEPA ordered CDE and the Dana Corporation to implement a removal action to address PCB contamination in soils at seven additional residential properties located to the west and southwest of the former CDE facility. This removal action was conducted from 1999 to 2000.

- In April 2000, USEPA entered into an Administrative Order on Consent (AOC) with DSC requiring the removal of PCB-contaminated soil from one additional property located on Spicer Avenue. DSC agreed to perform the work required under the AOC, but subsequently did not do so. In August 2004, USEPA began the removal of PCB-contaminated soil from this property; the work was completed in September 2004.

In 2000, FWENC conducted a RI that included the collection of soil, sediment, and building surface samples, as well as the installation and sampling of 12 shallow bedrock monitoring wells (FWENC, 2001b). The USEPA subsequently divided the Site into four OUs as described in Section 1.1. On September 30, 2003, USEPA issued a ROD for OU 1. The selected remedy included the removal of approximately 2,100 cubic yards of contaminated soils from neighboring properties as well as indoor dust remediation where PCB-contaminated dust was previously identified. Additional sampling (soil and dust) was proposed to determine if further remediation was required.

In August 2001, the RI Report for OU2 was issued. The FS for OU2 was issued in April 2004, and the ROD was issued on September 30, 2004. The remedy specified in the ROD included the excavation of PCB-contaminated soils and treatment on-site via Low

Temperature Thermal Desorption (LTTD) followed by backfilling with the treated material, transportation of contaminated soil and debris not suitable for LTTD treatment off-site for disposal and treatment, installation of site controls, and property restoration. Implementation of this remedy is currently underway.

In January 2008, eight deep bedrock wells were installed by USEPA to assess the hydraulic properties of the fractured bedrock and water quality of the bedrock groundwater up-gradient and down-gradient of the former CDE facility. Following completion of the well installation, groundwater VOC samples were collected from discrete water-bearing zones within each well. Additionally, groundwater samples were collected from the 12 existing shallow bedrock monitoring wells located at the former CDE facility. Louis Berger is currently performing an RI/FS for OU3; an additional 12 deep bedrock wells were installed in 2009. Further information regarding the findings of groundwater investigations for OU3 is available in the *Final OU3 RI/FS Work Plan* (Malcolm Pirnie, 2008).

2.2.3. Previous Investigations at OU4

USEPA conducted several initial studies to investigate contamination in Bound Brook sediments and floodplain soils. These investigations are summarized in the following sections.

2.2.3.1. Ecological Risk Assessment

In June and August 1997, USEPA collected soil, sediment, surface water, and biota samples (small mammals, crayfish, forage fish, and edible fish) along Bound Brook to support an ERA. Sampling locations were designed to characterize exposure in terrestrial and aquatic areas near Spring Lake, New Market Pond, Bound Brook, and Cedar Brook and are shown on Figures 2-3a through 2-3e. The sampling locations were organized according to numbered reach designations (Reach 1 through Reach 9) and stretched from RM2 to RM6.6 on Bound Brook with a few samples in Green Brook.

Samples were analyzed for VOCs, semi-volatile organic compounds (SVOCs), pesticides, PCB Aroclors, and metals. Results of the ERA are presented in the *Final Report: Ecological Evaluation for the Cornell-Dubilier Electronics Site* (USEPA, 1999a). The ERA concluded that the structure and function of the stream ecosystem within Bound Brook and its corridor was at risk from chemical contamination.

2.2.3.2. **1997 Soil and Sediment Sampling**

USEPA collected additional soil and sediment samples along Bound Brook from August to November 1997. Surface and subsurface sediment and soil samples were collected to characterize 2.4 miles of streambed and bank areas upstream and downstream of the former CDE facility (from RM4.2 to RM6.6), which are shown on Figures 2-4a through 2-4d. The sampling program included 100 transects across Bound Brook, spaced at varying intervals of 50 feet, 100 feet, and 200 feet distant from each other. Along each transect, five sampling locations were established: one sediment sampling location positioned in the middle of the stream and two soil sampling locations established on either side of the brook (5 feet and 10 feet upland from the water's edge). At each location, two discrete depth intervals were sampled to characterize the surface sediment (0-6 inches) and subsurface sediment (generally 18-24 inches below the sediment surface)[3]. Samples were analyzed for PCB Aroclors; these data are presented in the *Soil and Sediment Sampling and Analysis Summary Report* (Weston, 1998).

2.2.3.3. **1999 Cedar Brook and Spring Lake Sediment Sampling**

On April 20-21, 1999, the NJDEP collected sediment samples from 33 locations in Spring Lake, Cedar Brook, and a feeder stream between Maple Avenue and Cedar Brook. Sediment samples were collected at a depth of 0-6 inches at all locations. Five subsurface samples collected also collected from a depth of 18-24 inches. The samples

[3] Subsurface samples (soil or sediment) were targeted at a depth of 18-24 inches or core refusal. Subsurface samples were acquired at approximately half of the sampling locations.

were analyzed for PCB Aroclors and pesticides, and the data are provided in *Preliminary Assessment and Site Investigation, Spring Lake PCB Contaminatio*n (NJDEP, 1999).

2.2.3.4. **1999 Floodplain Soil and Sediment Sampling**

In June 1999, USEPA collected sediment samples and floodplain soil samples from four areas along Bound Brook and its tributaries as shown on Figure 2-5. These sampling areas were designated Area 1 “Veteran’s Memorial Park” (floodplain soil samples) Area 2 “North Side of Cedar Brook” (between Lowden Avenue and Oakmoor Avenue; floodplain soil and sediment samples), Area 3 “North Side of Bound Brook” (near Fred Allen Drive; floodplain soil samples), and Area 4 “South of New Market Avenue and East of Highland Avenue” (floodplain soil and sediment samples). Samples were analyzed for PCB Aroclors; these data are presented in the *Floodplain Soil/Sediment Sampling and Analysis Summary Report* (Weston, 2000).

2.2.3.5. **2007-08 Soil, Sediment, and Surface Water Sampling**

In April 2007, due to erosion, buried capacitor debris became exposed on the Bound Brook banks, just downstream of the twin culverts and adjacent to the former CDE facility. The 1997 sampling transects were re-occupied in 2007-2008 to re-characterize a half-mile of Bound Brook between RM6.10 and 6.67 (Figure 2-6). Samples were analyzed for PCB Aroclors; these data are presented in the *USEPA Sampling Report* (USEPA, 2008a).

A total of 44 surface water samples were also collected during the sampling event (one from each sediment sampling transect in the center of the brook). The surface water samples were collected during non-storm conditions and were laboratory-filtered prior to analysis for PCBs. All surface water sample analytical results were non-detect.

2.2.3.6. **2008 Test Pit Investigation**

On May 14, 2008, USEPA excavated 8 test pits (Test Pit 1 through Test Pit 8) on OU2. Test Pits 1, 2, and 8 were excavated on the bank adjacent to Bound Brook. Test Pits 3, 4, and 5 were excavated on an embankment adjacent to a wetland area bordering Bound Brook. Test Pits 6 and 7 were excavated on a level area on the southern portion of OU2. Each test pit was excavated to a depth of 2-4 feet below grade and observations were recorded regarding soil type and the presence of capacitor or other buried debris, if encountered. Capacitors and capacitor components were observed in Test Pits 2, 6, and 7 (Weston Solutions, 2008).

2.2.3.7. **2008 Wildlife Species Investigation**

A wildlife species investigation was conducted on several reaches of Bound Brook, from the Dismal Swamp to New Market Pond, in December 2008. The investigation consisted of a reconnaissance-level habitat assessment and wildlife species search to identify potential species occurrence in the Bound Brook ecosystem. The findings of the investigation are provided in the *Wildlife Species Investigation of the Bound Brook Ecosystem, South Plainfield, New Jersey* (Stantec, 2008). The survey areas investigated in the wildlife species investigation are shown on Figure 2-7.

2.2.3.8. **2008 USEPA Conrail Property Sampling**

In September 2008, the USEPA conducted sediment and soil sampling along portion of the Bound Brook that traverses Cornell-Dubilier Electronics Superfund Site, in historical Reach 3. In addition, sediment, soil, and water samples were collected from two drainage swales located in Reaches 2 and 3, and sediment adjacent to the third culvert in Reach 2. This round of sampling was prompted by the results of a December 2007 sampling event that was conducted in Reaches 1 through 4 to evaluate the presence of sources in nearby areas.

The objective of this study was to investigate PCB levels along the banks of and within the Bound Brook in areas previously known to contain elevated PCB concentrations.

2.2.3.9. **2008 Fish Tissue and 2009 USEPA Reassessment**

In September and October 2008, the USEPA collected fish and invertebrate clam samples from seven stations along the Bound Brook corridor to re-assess ecological risks in the Bound Brook system, and to provide a fingerprint of the PCB congeners within Bound Brook extending between the former CDE facility and New Market Pond. The sampling locations chosen for this study mirrored those utilized during 1997 ERA sampling (Section 2.2.3.1), with the exception of adjustments to those closest to the former CDE facility, and included six points within Bound Brook and one in Spring Lake. The fish species collected were targeted based on the data generated during the 1997 investigation. All biota samples were analyzed for Total PCBs, PCB Aroclors, and PCB Congeners. In addition, the analytical results of PCB congener analysis performed on 12 sediment samples collected by USEPA Region 2 were obtained and considered in the re-assessment. These samples correspond to two of the Bound Brook stations sampled for biota.

A wildlife species investigation was also performed as part of this reassessment in December 2009. Five reaches of the brook were surveyed, encompassing an areas from the Dismal Swamp to approximately 0.5 miles downstream of the confluence of Bound Brook and Cedar Brook. This investigation conclusively determined that several species utilize Bound Brook within the Site boundary.

The reassessment of ecological risk estimates supports the conclusion that substantive ecological risk does exist to fish and wildlife within both Bound Brook and Spring Lake.

3. INITIAL EVALUATION

3.1. REVIEW OF EXISTING DATA

3.1.1. Topography and Drainage

Section 2.1 of the *Preliminary Conceptual Site Model for OU4 of the Cornell-Dubilier Electronics Superfund Site* (Tetra Tech EC, Inc., 2006) summarizes topographic features and wetlands in OU4. Section 3.1.1 of the *Final OU3 Work Plan* (Malcolm Pirnie, 2008) summarizes topographic and drainage features on the former CDE facility; implementation of the OU2 ROD is expected to impact drainage into OU4.

3.1.2. Bound Brook Hydrology and Features

Bound Brook is a major tributary of Green Brook (a tributary of the Raritan River) in Middlesex County, New Jersey and is classified as freshwater, non-tidal (Figure 1-1).

Bound Brook and associated tributaries and impoundments are classified as freshwater, non-tidal (FW2NT) where designated uses are:

1. Maintenance, migration, and propagation of the natural and established biota;
2. Primary contact recreation;
3. Industrial and agricultural water supply;
4. Public potable water supply after conventional filtration treatment (a series of processes including filtration, flocculation, coagulation, and sedimentation, resulting in substantial particulate removal but no consistent removal of chemical constituents) and disinfection; and
5. Any other reasonable uses.

The Bound Brook headwater is located in Edison Township, New Jersey and flows westerly through the Borough of South Plainfield into Piscataway Township, where the water is dammed to form New Market Pond. The brook then flows through the Borough of Middlesex to the confluence with Green Brook. The Bound Brook sub-basin drains an estimated 48 square miles (Tetra Tech EC, Inc., 2006). Cedar Brook is a tributary to Bound Brook and its confluence with Bound Brook is located at approximately RM5.75, about 0.5 miles downstream of the former CDE facility. Three unnamed tributaries also drain into Bound Brook downstream of the former CDE facility, at approximately RM5.5, RM4.65, and RM4 (directly into New Market Pond), respectively.

The Green Brook watershed (which includes Bound Brook) is the focus of a USACE flood control project (USACE, 1997). Under flood conditions, floodwaters (that originate as runoff from the steep slopes of the Watchung Mountains) exceed the capacity of the Green Brook channel and overflow the divide between Cedar Brook and Green Brook. Floodwaters eventually return to Green Book via Cedar Brook and Bound Brook; however, due to the flat topography of the Bound Brook watershed, the City of Plainfield and nearby townships are inundated in the process (USACE, 1997).

No United States Geological Survey (USGS) gauging stations are positioned on Bound Brook. The nearest USGS gauging station (USGS No. 01403900) is located on Green Brook, one mile downstream of the confluence of Bound Brook and Green Brook. Information on Green Brook flow conditions at this gauging station is discussed in Section 2.2 of the *Preliminary Conceptual Site Model for OU4 of the Cornell-Dubilier Electronics Superfund Site* (Tetra Tech EC, Inc., 2006).

3.1.3. New Market Pond

New Market Pond is located on Bound Brook in the Township of Piscataway, along Lakeview Avenue, just west of the Piscataway-South Plainfield border. It has served for much of its existence as a mill pond and dates to the early nineteenth century.

During the late eighteenth century, the current community of New Market in Piscataway was referred to as Quibbletown, and the body of water now referred to as New Market Pond did not exist, according to two Revolutionary War-era sources. The 1777 Erskine map depicts a river (*i.e*., Bound Brook) extending through the Quibbletown area with no indications of a pond or lake. This map is consistent with a diary account by Johann Ewald, a Captain of infantry in the Hessian Field Jager Corps, dated February 8, 1777. The account describes a skirmish that occurred between Ewald's troops and an American force along Bound Brook at Quibbletown. The Hessians reportedly pursued retreating Americans to Quibbletown, where a skirmish occurred. Ewald describes the place as lying on two hills between which a river (*i.e*., Bound Brook) winds through a ravine that is spanned by two bridges. This ravine and the former location of the two bridges are now covered by New Market Pond. According to a local historian, the bridges spanned the ravine from the north and south, just east of present day New Market Pond dam, connecting to a small island in the middle of Bound Brook. Posts for the bridges reportedly were visible in the pond during periods of low water in the early twentieth century. Musket and cannon balls associated with the skirmish reportedly were recovered from the north side of the pond when the houses located there were constructed. If a mill pond was present during the 1777 skirmish, it is likely that Ewald would have mentioned it in his description of the area.

The Piscataway Historical Society, however, claims that a mill, and by inference, a mill pond, was located on Bound Brook in Quibbletown as of 1778 based on another Erskine map dating to that year. Either the 1778 Erskine map is incorrect or a mill pond was established sometime after 1777. It also is possible, although unlikely, that Ewald did not mention the pond's existence. In any case, the pond was present by the 1830's when a mill is known to have occupied the area by the present day gazebo in Columbus Park.

Based on cartographic sources, the pond apparently has remained approximately the same size and shape from the mid-nineteenth century until today. The mill and pond are clearly indicated on the portions of the nineteenth and twentieth century maps that show the Quibbletown area, now known as New Market. These maps include the 1840 United States Coast Survey; 1850 Otley and Kelly map; 1861 Walling map; 1872 Beers map; 1887, 1893, 1899, 1905, and 1925 USGS maps; and 1939 Franklin Survey Company map. The mill was destroyed by fire in 1924. The last remaining buildings of the grist mill were demolished, a new spillway constructed, and the turbines dug out during the summer of 2008, when the Town of Piscataway expanded Columbus Park. According to the maps, another mill apparently was located on the south side of the pond near the dam during the late nineteenth century. No other industries, factories, or other commercial structures reportedly were constructed along the pond.

During 1985-1986, New Market Pond was dredged to a depth of six to eight feet. According to a local historian, the dredge spoils were stored just beyond the eastern end of the lake for a period of time before being removed from the area. A record review on New Market Pond conducted by the Township of Piscataway identified five sampling reports (dating to the early 1980s) on sediment testing in New Market Pond prior to the dredging operation (USEPA, 1997). While proposed dredging operations and potential re-use of spoils as topsoil are discussed, information on the actual dredging operation is not provided. The sediment evaluation dated January 19, 1982 (USEPA, 1997) describes the pre-dredging sediments in New Market Pond as stratified with the surface layer composed of black organic silt (approximately 1 foot thick) followed by a brown/red-brown clayey-silt layer with varying amounts of sand. The brown/red-brown layer was further characterized with two Atterberg Limit values (liquid limit: 120 and

60.8 and plastic limit: 67.8 and 41.6). The subsurface layer was characterized with a few deep borings as gray and brown clayey-silt with sand. (Borings penetrated approximately 3 to 5 feet into the sediment bed.) Chemical analyses were conducted in 1982 on two New Market Pond sediment samples that were identified only as "Putnam Avenue" and "Pump Station." These results indicate elevated metals contamination while PCB concentrations are reported as "less than 1 µg/kg"[4] (USEPA, 1997).

3.1.4. Spring Lake

Spring Lake is located on the lower end of Cedar Brook in Spring Lake Park. The pond originally served as a mill pond and likely dates to the early nineteenth century. An earlier mill pond, dating possibly to 1683, was located east of the confluence of Bound Brook and Cedar Brook but no longer exists. A number of mills were located in the confluence area from the seventeenth century until the early twentieth century. At its height, Spring Lake covered over 200 acres with maximum depths of eight feet during the twentieth century. It spanned the Cedar Brook valley from bank to bank, extending to the backyards of the older houses and commercial buildings that line its banks, as seen in period photographs. The head of the lake included what is now Veterans Park (the monument and helicopter exhibit), the area having been filled.

Spring Lake is clearly indicated on nineteenth century maps that suggest that the lake varied in shape to some extent during this period, but was always about 200 acres in size. The historic maps reviewed that show the lake are the 1840 United States Coast Survey; 1850 Otley and Kelly map; 1861 Walling map; 1872 Beers map; 1887, 1893, 1899, 1905, and 1925 USGS maps; and 1939 Franklin Survey Company map. According to newspaper articles and a local historian, the sources of the lake were natural springs and an inflow from Holly Pond (which no longer exists due to filling) located at the

[4] µg/kg = microgram per kilogram of solids

Police Athletic League Building is, at the intersection of Maple Avenue and Monroe Avenue in South Plainfield, New Jersey.

Spring Lake began to accumulate silt deposits during the 1930s-1940s, with its depth being reduced from 8 feet to 3 feet by the early 1950s. By the late 1940s, the Middlesex Water Company had placed water wells proximal to the lake. According to period newspaper accounts, the presence of these wells and the sedimentation, as well as a period of drought, caused the lake to begin to dry up; however, some articles suggest that the drought was the primary cause of the lake's demise. By 1954, the lake was only a remnant of what it had been a couple of decades before, consisting only of patches of standing, shallow water, heavily infested by weeds and other vegetation. Photographs from this period show dried mud flats in areas once inundated.

The lake apparently improved somewhat over the next few years but it remained a relatively shallow body of water. By the early 1970s, the lake again was in a dismal condition and plans to rehabilitate Spring Lake and create a park surrounding it were developed. (Earlier plans for such work date back to the 1950s and 1960s but none came to fruition.) In the mid-1970s, the Middlesex County Mosquito Commission dredged Cedar Brook and Spring Lake from above the lake to the point where the Cedar Brook joins Bound Brook and from that point to the Clinton Avenue Bridge. The dredge spoils reportedly were spread onto the floodplain. During the early 1980s, once clear ownership of the lake and surrounding lands was determined, construction of the restored Spring Lake and new park began. The current lake is about 5 acres in size, a drastic reduction from its original size.

3.1.5. Climate

The climate for Middlesex County is classified as temperate. Polar continental air masses control the region's winter weather and tropical air masses control summer weather. In the summer, these tropical air masses, largely originating over the Gulf of

Mexico, travel about 1,000 miles over land before arriving in New Jersey. Although the heaviest rains are produced by coastal storms of tropical origin, a portion of the air masses originates from the Great Lakes. Prevailing winds are from the northwest from October through April, and from the southwest the remainder of the year.

In South Plainfield, the temperature ranges from an average of 29 degrees Fahrenheit in January to an average of 75 degrees Fahrenheit in July, with an average annual temperature of about 53 degrees Fahrenheit (FWENC, 2002). Summer temperatures occasionally exceed 100 degrees Fahrenheit and temperatures in the middle to upper 80's (degrees Fahrenheit) occur frequently. Winter temperatures generally are not below 20 degrees Fahrenheit for long periods of time (FWENC, 2002). The average annual precipitation is approximately 49 inches. Precipitation occurs fairly evenly throughout the year.

3.1.6. Regional Geology

The regional geology for OU4 is described in Section 3.1.3.1 of the *OU3 RI/FS Work Plan* (Malcolm Pirnie, 2008a) and Section 2.3 of the *Preliminary Conceptual Site Model for OU4 of the Cornell-Dubilier Electronics Superfund Site* (Tetra Tech EC Inc., 2006). OU4 lies within the Piedmont Physiographic Province (Fenneman, 1938).

3.1.7. Surficial Geology

Quaternary and pre-Quaternary glacial and glacial-fluvial deposits overlie bedrock across much of the northern portion of New Jersey. Figure 3-1 shows the glacial and surficial geologic units near OU4, including: alluvium; late Wisconsin glaciofluvial sand and gravel (outwash plain) deposits; swamp and marsh deposits; weathered shale, mudstone, and sandstone; and eolian deposits. According to the data presented on this figure, the former CDE facility is located on weathered shale, mudstone, and sandstone deposits. These materials consist of reddish-brown to yellow sandy, silty clay to clayey, silty sand containing some shale, mudstone, and sandstone fragments. These unconsolidated and weathered bedrock materials can be as much as 30 feet thick but are generally less than 10 feet thick (FWENC, 2002).

3.1.8. Bedrock Geology

OU4 is located within the Newark Basin, which is a tectonic rift basin that covers roughly 7,500 square kilometers extending from southern New York through New Jersey and into southeastern Pennsylvania (Figure 3-2). The basin is filled with Triassic-Jurassic sedimentary and igneous rocks that are tilted, faulted, and locally folded. Most of the tectonic deformation occurred during the Late Triassic to Middle Jurassic. The Newark Basin probably evolved from a series of smaller, isolated sub-basins occurring along several normal faults early in the Late Triassic. As continental extension continued the basin grew in width and length depositing sub-braided and meandering stream deposits (Stockton Formation) grading into lakebed and mudflat deposits (Lockatong and Passaic Formations). Figure 3-2 shows the stratigraphic units of the Newark Basin, and Figure 3-3 shows a geologic cross-section through the region.

The Passaic Formation (historically known as the Brunswick Formation) occupies an upper unit of the Newark Supergroup rocks in the Triassic-Jurassic Newark Basin. The basin filled with thousands of feet of sediments over a period of about 45 million years (USGS, 1998). The Passaic Formation is the thickest and most aerially extensive unit in the Newark Basin. This formation consists of mostly red cyclical lacustrine clastics including mudstone, siltstone, and shale, with minor fluvial sandstone (Michalski and Britton, 1997). The reddish color originates from reworked hematite, which comprises 5 to 10 percent of the unit. The former CDE facility is located immediately south of the contact between the Passaic Formation mudflat deposits, which are a thickly bedded mudstone, and the Passaic Formation, which is often thinly bedded sandstone and siltstone (Figure 3-4).

3.1.9. Regional Hydrogeology

The regional hydrogeology for OU4 is described in Section 3.1.4.1 of the *OU3 RI/FS Work Plan* (Malcolm Pirnie, 2008a) and Section 2.4 of the *Preliminary Conceptual Site Model for OU4 of the Cornell-Dubilier Electronics Superfund Site* (Tetra Tech EC Inc., 2006).

The Passaic Formation contains an aquifer that is used as a source of potable water for some of the communities surrounding the former CDE facility. Numerous private, industrial, and municipal wells tap the formation with pumping rates that range from a few to several hundred gallons per minute. The Passaic Formation generally forms tabular aquifers and confining units that are several tens of feet thick. Groundwater flow is primarily through bedding planes and interconnected fractures and dissolution channels (secondary permeability). A very limited amount of groundwater flows through the interstitial pore spaces between silt or sand particles because of compaction and cementation of the formation (primary permeability). Differences in permeability between layers, resulting from variations in fracturing and weathering, may account for many discrete water-bearing units.

These water-bearing units are generally restricted to bedding planes, intensively fractured seams, and near vertical fracture and joints that are sub-parallel to the strike of the formation in this leaky multi-layered aquifer system (Michalski, 1990; Michalski and Klepp, 1990; Michalski and Britton, 1997). Michalski and Britton (1997) contend that this is typically true because potential groundwater flow in the downdip direction is either impeded by a reduction in bedding plane apertures at greater depths or groundwater flow along the strike is favored over a longer downdip flow path and subsequent updip flow near a recharge zone. However, groundwater could flow downdip through a fracture network or along bedding planes if groundwater flow is affected by pumping wells in the area.

Groundwater in the Passaic Formation is often unconfined in the shallower, more weathered part of the aquifer and confined or semi-confined in the deeper part of the aquifer. Silt and clay derived from the weathering process typically fill fractures, thereby reducing permeability. This relatively low permeability surface zone reportedly extends 50 to 60 feet bgs (Michalski, 1990). Groundwater in the lower portion of the Passaic Formation is generally semi-confined. Recharge is by leakage through fractures in the confining units. The transmissivity of mudstone and siltstone units can range from 400 to 14,500 gallons per day per foot (gpd/ft) (Herman, 2001).

The investigations described in the *OU3 RI/FS Work Plan* (Malcolm Pirnie, 2008a) include a preliminary evaluation of the potential connection between groundwater and OU4 surface water proximal to the former CDE facility. Additional studies may be required during the OU4 RI field investigations to further characterize the potential discharge of groundwater to Bound Brook.

3.1.10. Population and Environmental Resources

Population, Land Use, Zoning - The former CDE facility is located in the central portion of New Jersey and can be characterized as an urban area. The land use surrounding the former CDE facility is primarily commercial/light industrial to the northeast and east, residential to the south and north, and mixed residential/commercial to the west. The former CDE facility is currently zoned as commercial/industrial. The area within 1.5 miles of the former CDE facility contains eight schools and five parks. Two elementary schools are located approximately 2,000 feet from the former CDE facility (one to the north and one to the south).

South Plainfield is bordered by Piscataway on the south and west, Edison on the east, and Plainfield on the north. According to the 2006 Census estimate, South Plainfield has a population of approximately 22,795 people with a total land area of approximate 8.4 square miles (city-data.com) with 0.48 percent of this area covered by water. South Plainfield's population includes Caucasian (78 percent), African American (9 percent), Asian (8 percent), and Hispanic and other racial and ethnic groups (5 percent).

Environmental Resources – Bound Brook is directly adjacent to the former CDE facility and forms the northeast border of the property. The portion of Bound Brook adjacent to and downstream of the former CDE facility extends from east to west through Edison, South Plainfield, New Market, Dunellen, and Middlesex. The low topography of Bound Brook has created the watershed features, hydrology, and drainage characteristics found in the region.

Based on a review of National Wetlands Inventory (NWI) mapping, three wetland systems are present on the former CDE facility property (OU2) and associated with Bound Brook and its floodplain. The wetlands are classified as Palustrine Forested Broad-Leaved Deciduous Temporary (PFO1A), Palustrine Emergent Persistent Seasonal (PEM1C), and Palustrine Scrub/Shrub Broad-Leaved Deciduous Temporary (PSS1A). Wetland acreage ranges from 0.06 acres to 2.08 acres. Malcolm Pirnie completed a wetland delineation in May 2007 to demarcate wetland/non-wetland boundaries as part of the remedial design for OU2. More information can be found in the *Revised Final Habitat Assessment Report for Operable Unit 2 Soils* (Malcolm Pirnie, 2008b).

The developed portion of the former CDE facility contains a network of catch basins to channel storm water runoff. Based on dye testing from the 2000 RI, it is believed that at least a portion of the catch basins drain into two outfalls along Bound Brook (FWENC, 2002). The stormwater system has been impacted by ongoing OU2 remedial activities; final stormwater conveyance system details will be identified by the OU2 RA contractor upon completion of these remedial issues. Existing culverts at the former CDE facility are shown in Attachment 1. Any debris located within these culverts will be disposed of by the OU2 RA contractor.

3.1.11. Sources and Distribution of Contamination

Chemical contamination at the former facility has been attributed to historic manufacturing activities. As described in Section 2.2.1, CDE used PCBs and chlorinated organic solvents in their manufacturing process. The company evidently disposed of PCB-contaminated materials and other hazardous materials directly on the former CDE facility soils. These activities apparently led to widespread chemical contamination at the former CDE facility as well as the migration of chemicals to other areas, including: adjacent residential, commercial, and municipal properties and the surface water and sediments of Bound Brook.

The following potential pathways were listed in the *Preliminary Conceptual Site Model for OU4 of the Cornell-Dubilier Electronics Superfund Site* (Tetra Tech EC Inc., 2006) for the transport of contaminants into and within Bound Brook from the former CDE facility and other potential sites/sources:

- Direct disposal of contaminated materials in Bound Brook or adjacent areas.
- Migration of contaminants via surface runoff.
- Migration of contaminants via drainage systems.
- Migration of contaminants through groundwater to surface water via discharge to Bound Brook's transition zone.
- Migration of contaminants within surface water and sediments.
- Migration of contaminants into biota.
- Migration of contaminants into air.

Investigations conducted for the OU3 RI indicate shallow groundwater is discharging into Bound Brook in the vicinity of the former CDE facility. Surface water runoff, discharge from the former CDE facility's interconnected floor drains, and discharge from stormwater catch basins that may have discharged to two locations along Bound Brook may have contributed to chemical contamination in the sediments of Bound Brook. Previous stabilization measures (*i.e.*, paving and silt fencing) that were implemented by the property owner in 1997 addressed the potential for chemicals to reach Bound Brook via overland runoff and through the facility drainage system discharges (HydroQual, 2005). Subsequent removal of existing site buildings and placement of interim asphalt capping material as part of the OU2 ROD implementation further reduced the potential for chemical contaminants to reach Bound Brook.

3.1.12. Chemical Characterization: Preliminary Data Evaluation

Preliminary statistical and spatial evaluations of existing data were conducted to identify data gaps and provide input to the recommendations for RI data collection efforts. This section describes the data sources, evaluation methods, and findings.

3.1.12.1. **Electronic Data Sources**

The preliminary data evaluation incorporated data from prior OU4 investigations that were compiled in electronic format for USEPA (TetraTech EC, Inc., 2007). These compiled electronic data consisted of selected sample matrices, parameters, and results from the prior investigations. For example, metals data provided electronically consisted of five parameters: arsenic, chromium, lead, mercury, and zinc. Compiled data were provided as a Geographic Information System (GIS) deliverable on compact-disc (CD) and were originally reported in the documents listed below:

- Final Report, Ecological Evaluation for the Cornell Dubilier Electronics Site (USEPA, 1999a).

- Soil and Sediment Sampling and Analysis Summary Report (USEPA, 1998a) and Addendum No. 1 (USEPA, 1999b).

- Floodplain Soil/Sediment Sampling and Analysis Summary Report (Weston, 2000).

The GIS data were updated with new base maps and data layers. A river mile system was added with the origin at the confluence of Green Brook and Bound Brook. The plotted sampling points were checked against hardcopy maps provided with the above-listed reports for consistency. Although not all data were provided electronically, the number of sampling locations in the GIS matched the sampling locations identified in the reports.

The preliminary data evaluation also incorporated two other electronic datasets. The first dataset included soil samples that were collected along Fred Allen Drive and Lowden Avenue. These soil samples were not discussed in the reports listed above but were provided on the CD from TetraTech EC Inc. The second dataset included PCB Aroclor data (results and qualifiers) for the 1997 sampling event in Bound Brook and the supplemental 2007-2008 sampling event, which was documented in the *2007-2008 USEPA Sampling Report* (USEPA, 2008a).

3.1.12.2. **Metals Sediment Data Evaluation**

Surface sediment metal results (arsenic, chromium, lead, mercury, and zinc) were provided from 1997 samples. To evaluate potential trends along Bound Brook, surface sediment metal concentrations were plotted versus river mile and are shown on Figure 3-5a through Figure 3-5e. Samples collected from Cedar Brook are plotted at RM5.75 (the confluence of Cedar Brook and Bound Brook). In general, reported 1997 surface sediment metal concentrations in Bound Brook were higher than the “lowest effects level” (LEL) established by NJDEP for freshwater ecosystems (NJDEP, 1998);

however, concentrations did not exceed the “severe effects level.” Note that the majority of the mercury data was reported as zero and plotted below the LEL line.

Statistical trend analyses (Mann Kendall and linear regression) of the 1997 surface sediment metals concentrations suggest that the metals concentrations decrease (*e.g.*, negative slope) downstream and to the west of the former CDE facility; however, the large scatter in the metals data and the low linear regression coefficient suggest a low significance to this trend.

3.1.12.3. **PCB Sediment Data Evaluation**

Surface sediment PCB concentrations were available for three sampling events: 1997, 1999, and 2007-2008; however, these PCB data were available in different formats, including Total PCB concentrations (with no information on the data summation) and PCB Aroclor concentrations. To evaluate potential trends initially along Bound Brook, Total PCB surface sediment concentrations (as received from TetraTech EC Inc.) were plotted versus river mile and are shown on Figure 3-6. Samples collected from Cedar Brook are plotted at RM5.75 (the confluence of Cedar Brook and Bound Brook) and samples collected in Green Brook are plotted at RM0. In general, elevated Total PCB concentrations were detected above RM4.5 with concentrations as high as approximately 40 milligrams per kilogram of solids (mg/kg) detected in 1997 and approximately 190 mg/kg detected in 1999. Statistical trend analyses were conducted on the entire dataset; however, the large group of non-detected Total PCB concentrations above RM6.5 (corresponding to Transect A through Transect L in 1997) biased the trend analyses.

The 1997 Total PCB data were then re-plotted on a spatial map provided as Figure 3-7. Total PCB concentrations greater than 1 mg/kg were observed near the former CDE facility, suggesting a Total PCB source at that location. Lower levels of Total PCB were observed directly upstream and downstream of the former CDE facility;

however, limited physical parameters (*e.g.*, grain size distribution and total organic carbon) restrict the interpretation of these data. Elevated Total PCB concentrations were also observed between RM5 and RM6 – moreover, the highest Total PCB concentrations reported during the 1997 sampling event are located between RM5 and RM6. These elevated concentrations may be associated with bank erosion and sediment transport downstream (Bound Brook is known to be 'flashy' and to respond quickly to storm flows during rain events) or possibly contaminant loading from the tributaries. Sampling locations in New Market Pond were generally limited to the western, downstream end of the pond, preventing a robust evaluation of spatial trends within New Market Pond.

The 1997 sampling locations near the former CDE facility were then re-occupied in 2007-2008 [*i.e.*, Transect A (RM6.67) through Transect RR (RM6.19)][5]. This re-occupation of sampling locations allowed a data comparison of surface concentrations collected approximately 10 years apart. For this comparison, the PCB Aroclor mixture was examined instead of plotting Total PCB concentrations. In 1997, the laboratory reported Aroclor 1016 through Aroclor 1260; however, all Aroclor mixtures were reported as non-detected concentrations except for Aroclor 1254. In 2007-2008, the laboratory reported Aroclor 1016 through Aroclor 1268. In general, Aroclor 1254 was the predominant mixture reported in 2007-2008, with Aroclor 1260, Aroclor 1248, and Aroclor 1242 detected in less than 3 percent of the samples (*i.e.*, 14 of the 462 collected samples). For an accurate data comparison, only Aroclor 1254 results from the 1997 dataset and the 2007-2008 dataset were compared. Moreover, for this comparison, non-detected Aroclor 1254 concentrations were presented as half the reported laboratory detection limit.[6]

[5] Sediment sampling locations are positioned in the middle of the stream along each transect.
[6] Nondetected concentrations were defined as any sample containing a U laboratory qualifier.

Aroclor 1254 concentrations in Bound Brook surface sediments (0-6 inches) and deep sediments (greater than 6 inches)[7] near the former CDE facility for the 1997 and 2007-2008 sampling events are plotted in Figure 3-8 and Figure 3-9. In general, Aroclor 1254 surface sediment concentrations were elevated compared to deeper sediment concentrations, and the 2007-2008 sampling event reported higher concentrations of Aroclor 1254 than the 1997 sampling event (Box A). Note that this observation is strictly based on sampling depth – without radiological indicators and knowledge of site-specific sedimentation rates, a direct comparison on the same time horizons was not possible. (For example, a “deep” sediment sample that was collected in 1997 could possibly be re-sampled as “surface” sediment in 2007, depending on the extent of erosion.)

Box A: Statistical Results of Aroclor 1254 for 1997 and 2007-2008 Sampling Event (sediments only)

Matrix [1]	1997 Sampling Event [,2,3] Aroclor 1254 Concentration (mg/kg)	2007-2008 Sampling Event [2,3] Aroclor 1254 Concentration (mg/kg)
Surface Sediment	Average = 2.0 ±4.9 mg/kg Median = 0.33 mg/kg	Average = 10 ±2.9 mg/kg Median = 2.5 mg/kg
Deep Sediment	Average = 1.0 ±2.1 mg/kg Median = 0.027 mg/kg	Average = 6.1 ±14 mg/kg Median = 0.60 mg/kg

1. Surface Sediments represent 0-6 inches; Deep Sediments represent greater than 6 inches. Note that deep sediment samples were only collected at approximately half of the sampling locations.

2. Statistics represent the mathematical average and one standard deviation.

3. Nondetected Aroclor 1254 concentrations were incorporated into the statistics as half the reported laboratory detection limit.

mg/kg =milligrams per kilogram of solids

The large standard deviation on the mathematical average, compounded with the difference between the median and the average, indicate the skew in the Aroclor data and a wide range of reported concentrations. Relatively elevated Aroclor 1254 concentrations were detected in 1997 and 2007-2008 near RM6.35 (Transect BB

[7] Deep sediments typically represent samples collected at 18-24 inches below the sediment-water interface, except when core refusal resulted in a shallower sample.

through Transect EE)[8] and near RM6.52 (Transect N through Transect P)[9]. Both of these areas are proximal to the former CDE facility and likely represent a source of PCB to Bound Brood; however, their impact is quickly dissipated in the brook with lower levels of Aroclor 1254 observed directly upstream and downstream of these areas (Figure 3-8 and Figure 3-9).

3.1.12.4. **Metals Soil Data Evaluation**

Surface soil metals concentrations were provided from upland areas sampled in 1999 and 2000 and from the stream banks (RM4 to RM7) sampled in 1997. Surface soil concentrations for arsenic, chromium, lead, mercury, and zinc are shown on Figures 3-10a through Figure 3-10e, respectively. Sampling locations along the stream bank were plotted according to their corresponding river mile, whereas upland sample groups were plotted at one river mile chosen to represent the approximate location of the entire sample group. These upland sampling areas include:

- Area 1 “Veteran’s Memorial Park” is located at the confluence of Cedar Brook and Bound Brook (Figure 2-4) and includes walking paths, tennis courts, and athletic fields. Sampling data from Area 1 plot at RM6.55 as a Bound Brook symbol on Figures 3-10a through Figure 3-10e.

- Area 2 “North Side of Cedar Brook” (between Lowden Avenue and Oakmoor Avenue) is located on the northern bank of Cedar Brook in a wooded area adjacent to a residential area (Figure 2-4). Sampling data from Area 2 plot at RM5.75 as a Cedar Brook symbol on Figures 3-10a through Figure 3-10e.

[8] Transect BB through Transect EE correspond to the undeveloped area between the railroad alignments, north of the former CDE facility.
[9] Transect N through Transect P correspond to the undeveloped area downstream of the culvert on the northwest corner of the former CDE facility.

- Area 3 “North Side of Bound Brook” (near Fred Allen Drive) is located on the northern bank of Bound Brook between RM5.35 and RM5.55 in a wooded area adjacent to a residential area (Figure 2-4). Sampling data from Area 3 plot at RM5.45 as a Bound Brook symbol on Figures 3-10a through Figure 3-10e.

- Area 4 “South of New Market Avenue and East of Highland Avenue” is located near an unnamed tributary of Bound Brook adjacent to railroad tracks and includes a paved parking area. Sampling data from Area 4 plot at RM5.55 as an unnamed tributary symbol on Figures 3-10a through Figure 3-10e.

- NJDEP residential and non-residential soil cleanup criteria are also provided on the plots for reference.

Surface soil metals concentrations in each upland area vary by more than a factor of three; however, in 1997, the average surface soil concentrations for arsenic, chromium, mercury, and zinc were less than the NJDEP residential and non-residential direct contact criteria. (Note that while the average soil concentration was less than the direct contact criteria, some exceedences were observed for arsenic and zinc.) The average lead concentration exceeded the residential direct contact criterion in Area 1 and Area 4, and the average lead concentration in Area 3 (along the northern banks of Bound Brook) exceeded the non-residential direct contact criterion.

3.1.12.5. **PCB Soil Data Evaluation**

Surface soil Total PCB concentrations in these upland areas are shown on Figure 3-11. In 1997, the average surface soil Total PCB concentrations for Area 2 exceeded the NJDEP residential direct contact criteria, and the average surface soil Total PCB concentrations in Area 1 and Area 3 exceeded the NJDEP non-residential direct contact criteria. The elevated Total PCB surface soil concentrations observed in Area 3 (along the banks of Bound Brook) suggest that the banks and floodplain of Bound Brook may be impacted by transport of contaminated solids from the former CDE facility.

To further investigate PCB contamination in the banks and floodplains of Bound Brook, Aroclor 1254 data reported for the 1997 and 2007-2008 sampling events were examined using the same methodology described above, with nondetected Aroclor 1254 concentrations incorporated as half of the reported laboratory method detection limit. For both of these studies, four soil sampling locations were positioned along each transect [*i.e.*, Transect A (RM6.67) through Transect RR (RM6.19)]; two locations were on the south stream bank and two were located on the north stream bank.[10]

In general, the reported Aroclor 1254 concentrations for the 2007-2008 sampling event were greater than the concentrations reported for the 1997 sampling event (Box B); however, the large standard deviation on the mathematical average compounded with the difference between the median and the average, indicate that the Aroclor data are skewed with a wide concentration range.

Box B: Statistical Results of Aroclor 1254 for 1997 and 2007-2008 Sampling Event (soils only)

Matrix [1]	1997 Sampling Event [,2,3] Aroclor 1254 Concentration (mg/kg)	2007-2008 Sampling Event [2,3] Aroclor 1254 Concentration (mg/kg)
Surface Soil	Average = 7.7 ±61 mg/kg Median = 0.89 mg/kg	Average = 16 ±29 mg/kg Median = 3.4 mg/kg
Deep Soil	Average = 5.6 ±27 mg/kg Median = 0.24 mg/kg	Average = 27 ±75 mg/kg Median = 2.2 mg/kg

1. Surface Soils represent 0-6 inches; Deep Soils represent greater than 6 inches. Note that deep soil samples were only collected at approximately 60 percent of the sampling locations.

2. Statistics represent the mathematical average and one standard deviation.

3. Nondetected Aroclor 1254 concentrations were incorporated into the statistics as half the reported laboratory detection limit.

mg/kg =milligrams per kilogram of solids

[10] On each side of the stream bank, the first soil sample was located approximately 5 feet from the stream's edge and the second soil sample was located 10 feet from the stream's edge.

Figure 3-12 and Figure 3-13 present the Aroclor 1254 concentration versus river mile for surface and deep soil samples collected along Bound Brook. River miles for the soil samples were assigned based on their transect identification label, such that sediment and soil samples along the same transect could be compared (as depicted in Figure 3-14 and Figure 3-15). Similar to the PCB pattern observed in the sediment samples, Aroclor 1254 soil concentrations on the banks between RM6.19 and RM6.67 near the former CDE facility are elevated. Moreover, spikes in the Aroclor 1254 soil concentrations near RM6.35 (Transect BB through Transect EE) and near RM6.52 (Transect N through Transect P) overlay with observed spikes in the Aroclor 1254 sediment concentration. Unlike the Aroclor 1254 spike observed in the sediments (refer to Section 3.1.12.3), the spike in the soils dissipates more slowly, resulting in a wider band of PCB contamination on the banks (Figure 3-14 and Figure 3-15).

3.1.12.6. **Cedar Brook and Spring Lake Sediment Data Evaluation**

On April 20 and 21, 1999, the Environmental Measurements and Site Assessment (EMSA) section of the NJDEP collected sediment samples from 33 locations in Spring Lake, along the stretch of Cedar Brook from Plainfield High School to Spring Lake, and along a feeder stream between Maple Avenue and Cedar Brook. The easternmost sample collected along the feeder stream was defined as the background sample.

Material was collected from the 0-6-inch (shallow) horizon at all 33 locations, and from the 18-24-inch (deep) horizon at five of the 33 locations, for a total of 38 samples. A summary of the sampling program is presented in Table 3-1. All collected sediments were analyzed for PCB Aroclors, and for pesticides.

Shallow Sample Results

PCB Aroclors were not detected in any of the shallow sediment samples. Nine pesticides were detected in 27 of the 33 samples collected from the 0 to 6-inch horizon, including 4,4’-DDD, 4-4’-DDE, 4,4’-DDT, alpha-chlordane, endosulfan sulfate, endrin aldehyde, endrin ketone, gamma-chlordane, and heptachlor epoxide. The distribution and concentration of each ranged as follows:

- 4,4'-DDD was detected in eight samples at concentrations that ranged from 14 to 91 ug/kg and had an average value of 32.8 ug/kg.
- 4-4'-DDE was detected in four samples at concentrations that ranged from 14 to 48 ug/kg and had an average of 33.0 ug/kg.
- 4,4'-DDT was detected in 18 samples at concentrations that ranged from 6.6 to 690 ug/kg and had an average of 86.5 ug/kg.
- Alpha-chlordane was detected in 26 samples at concentrations that ranged from 9.5 to 170 ug/kg and had an average of 50.6 ug/kg.
- Endosulfan sulfate was detected in one sample at a concentration of 31 ug/kg.
- Endrin aldehyde was detected in five samples at concentrations ranged from 9.4 to 30 ug/kg and had an average of 18.1 ug/kg.
- Endrin ketone was detected in three samples at concentrations that ranged from 12 to 90 ug/kg and had an average of 38.7 ug/kg.
- Gamma-chlordane was detected in 26 samples at concentrations that ranged from 8.6 to 130 ug/kg and had an average of 43.1 ug/kg.
- Heptachlor epoxide was detected in four samples at concentrations ranged from 6.9 to 23 ug/kg and had an average of 16.2 ug/kg.

Surface sediment detections are presented in Table 3-2. Shallow samples are denoted by an "S" in the sample identification

Of the nine contaminants detected, alpha-chlordane, gamma-chlordane, and 4-4'-DDT were observed the most often with detection frequencies of 79%, 79%, and 55%, respectively. All other parameters were detected in less than 25% of the samples. Summary statistics for the surface samples are included in Table 3-3.

Deep Sample Results

PCB Aroclors were not detected in any of the deep sediment samples. Four pesticides were detected in three of the five samples collected from the 18 to 24-inch horizon, including 4,4'-DDE, 4,4'-DDT, alpha-chlordane, and gamma-chlordane. Of these pesticides, all but gamma-chlordane were detected in single samples; gamma-chlordane was observed in all three samples at concentrations that ranged from 9.8 to 12 ug/kg and had an average of 10.6 ug/kg. Deep sediment concentrations and summary statistics are presented in Table 3-2 and Table 3-4, respectively. Deep samples are denoted by a "D" (*e.g.,* 1S or 33D) in the sample identification.

Findings

In general, alpha- and gamma-chlordane were observed in higher concentrations from Spring Lake upstream to Cedar Brook to where a large storm water drainage pipe at South Plainfield High School discharges into the brook (NJDEP, 1999). DDD was primarily observed on the Middlesex Water Company Property, which lies north of Spring Lake Park (NJDEP, 1999). DDT was detected throughout Cedar Brook to the north of Spring Lake Park (NJDEP, 1999).

Sediment LEL guidance for three constituents were considered in the study: chlordane (alpha- and gamma-chlordane isomers of chlordane are not distinguished), DDT, and DDD (NJDEP, 1999). Comparison of the detected results to sediment guidance values for these parameters indicates that all detections of alpha-chlordane, gamma-chlordane and DDD, and all but one detection of DDT exceeded the lowest effects level LEL criteria.

3.1.12.7. **Chemical Characteristics of Surface Water**

Surface water samples were collected for analysis from Bound Brook during USEPA's 1999 Ecological Evaluation (refer to Section 2.2.3.1) and the 2007-08 sediment and surface water sampling event at RM6.1 to RM6.67 (refer to Section 2.2.3.5). In addition to PCBs, preliminary chemicals of potential concern (COPCs) in surface water indicated by the 1999 Ecological Evaluation include 1,1,2,2-tetrachloroethane, trichloroethene, and manganese, and preliminary chemicals of potential ecological concern (COPECs) include methyl tert butyl ether, bis(2-ethylhexyl)phthalate, barium, lead, and manganese. A more detailed discussion of the results of the 1999 surface water sampling is presented in Section 3.3 and the associated tables. All surface water sample analytical results obtained during the 2007-08 investigation were non-detect.

3.2. PRELIMINARY IDENTIFICATION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Section 121(d)(2)(A) of CERCLA incorporates into law the CERCLA Compliance Policy, which specifies that Superfund remedial actions must meet the federal standards, requirements, criteria, or limitations that are determined to be ARARs. State ARARs must be met if they are more stringent than federal requirements. Furthermore, Section 121 requires the selection of a remedial action that is protective of human health and the environment. Determining protectiveness involves a risk assessment in accordance with CERCLA guidance.

To Be Considered Criteria (TBCs) are non-promulgated advisories or guidance issued by federal or state government that are not legally binding and do not have the status of potential ARARs. As described below, TBCs will be considered along with potential ARARs as part of the risk assessment for OU4 and may be used in determining the necessary level of cleanup for protection of human health and the environment.

The USEPA requires that the implementation of remedial actions should also comply with ARARs (and TBCs as appropriate) to protect public health and the environment. ARARs (and TBCs necessary for protection), pertaining both to chemical levels and to performance or design standards, should generally be attained at all points of exposure, or at the point specified by the ARAR itself. ARARs (and TBCs necessary for protection) must be attained for hazardous substances, pollutants, or chemicals remaining at the completion of the remedial action, unless waiver of an ARAR is justified.

This section of the Work Plan provides a preliminary determination of the federal and state environmental and public health requirements that are potential ARARs and TBCs for OU4. The information in this section is based upon *CERCLA Compliance with Other Laws Manual: Interim Final* (USEPA, 1988b) and *CERCLA Compliance with Other Laws Manual: Part II, Clean Air Act and Other Environmental Statutes and State Requirements* (USEPA, 1989c).

3.2.1. Definition of ARARs

A requirement under other environmental laws may be either "applicable" or "relevant and appropriate" but not both. Identification of ARARs must be done on a site-specific basis and involves a two-part analysis: 1) a determination whether a given requirement is applicable, and 2) if it is not applicable, a determination whether it is nevertheless both relevant and appropriate.

Applicable Requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, chemical, remedial action, location, or other circumstance at a CERCLA site.

Relevant and Appropriate Requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal law or state law, while not "applicable" to a hazardous substance, pollutant, chemical, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

Three classifications of ARARs have been established and include:

- Chemical-Specific: usually health or risk-based numerical values or methodologies, which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment.

- Location-Specific: restriction placed on the concentration of hazardous substances or the conduct of activities solely because they occur in special locations.

- Action-Specific: usually technology or activity-based requirements or limitations on actions taken with respect to hazardous wastes.

3.2.2. Preliminary Identification of Potential ARARs and TBCs

The following is a preliminary list of potential ARARs and TBCs for contaminated media and potential remedial activities at OU4.

3.2.2.1. Potential ARARs

Chemical-Specific Federal ARARs

- Toxic Substances Control Act (TSCA) of 1976 (40 CFR [Code of Federal Regulation] Part 761).

- Safe Drinking Water Act, Maximum Chemical Levels (MCLs) (40 CFR Parts 141.11-.16).
- Identification and Listing of Hazardous Waste (40 CFR Parts 239-299).
- Clean Water Act, Ambient Water Quality Criteria (AWQC) (section 304) and Effluent Discharge Limitations.
- National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50).
- National Emission Standards for Hazardous Air Pollutants (NESHAPs) (40 CFR Part 61).
- New Source Performance Standards (NSPS) (40 CFR Part 60).

Chemical-Specific State ARARs

- New Jersey State Safe Drinking Water Act Maximum Chemical Levels (MCLs, [New Jersey Administrative Code] NJAC 7:10 1.1-7.3).
- New Jersey State Ground Water Quality Criteria (GWQC, NJAC 7:9-6).
- New Jersey Clean Water Act, Surface Water Quality Standards (NJAC 7:9-4).
- New Jersey Soil Cleanup Standards for Contaminated Sites (NJAC 7:26D).
- New Jersey State Toxic Effluent Limitations (NJAC 7:14A-1 et seq.).
- New Jersey Clean Air Act (NJAC 7:27-13 and NJAC 7:27-17).

Location-Specific Federal ARARs

- Protection of Wetlands (Executive Order 11990).

- Floodplain Management (Executive Order 11988).
- Statement of Procedures on Floodplain Management and Wetlands Protection (40 CFR Part 6, Appendix A).
- USEPA Office of Solid Waste and Emergency Response Policy on Floodplains and Wetland Assessments for CERCLA Actions, August 1985.
- USEPA National Guidance, Water Quality Standards for Wetlands (WQSW), Appendix B to Chapter 2, General Program Guidance of the Water Quality Standards Handbook, July 1990.
- Clean Water Act, Section 404 (40 CFR 230, 33 CFR 320-330).
- Flood Disaster Protection Act of 1973.
- National Historic Preservation Act (16 USC 470) Section 106 *et seq*.
- Resource Conservation and Recovery Act (RCRA) Location Requirements for 100-year Floodplains (40 CFR Part 264.18(b)).
- Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq*.).
- Safe Drinking Water Act (40 CFR 141, 142, 143), National Primary and Secondary Drinking Water Regulations.

Location-Specific State ARARs

- New Jersey State Freshwater Wetlands Protection Act (NJSA 13:9B).
- New Jersey State Freshwater Wetlands Regulations (NJAC 7:7).
- New Jersey State Flood Hazard Area Control Act (NJSA 58:16A-50).

- New Jersey Conservation Restriction and Historic Preservation Restriction Act (NJSA 13:8 B-1).

Action-Specific Federal ARARs

- National Contingency Plan (40 CFR 300, CERCLA Title I Section 101,111).
- Superfund Amendments and Reauthorization Act (SARA; 42 U.S.C. 9601).
- Hazardous and Solid Waste Amendments of 1984 (HSWA).
- RCRA (40 CFR 262), Generator Requirements for Manifesting Waste for Off-Site Disposal.
- RCRA (40 CFR 263), Transporter Requirements for Off-Site Disposal.
- RCRA (40 CFR 268), Land Disposal Restrictions.
- Safe Drinking Water Act (40 CFR 141, 142, 143), National Primary and Secondary Drinking Water Regulations.
- Clean Water Act (40 CFR 122-125), National Pollutant Discharge Elimination System (NPDES) Permit Requirements.
- Clean Air Act (40 CFR 50), NAAQS – Particulates.
- Clean Air Act (40 CFR 50), NSPS.
- Clean Air Act (40 CFR 61) NESHAPS.
- Hazardous Materials Transportation Act, (49 CFR 107, 171, 172, and potentially 174, 176 or 177), Rules for Transportation of Hazardous Materials.

- Occupational Safety and Health Act (29 CFR 1904), Recordkeeping, Reporting, and Related Regulations.
- Occupational Safety and Health Act (29 CFR 1910), General Industry Standards.
- Occupational Safety and Health Act (29 CFR 1926), Safety and Health Standards.
- Endangered Species Act (16 USC Part 1531) and Interagency Cooperation – Endangered Species Act of 1973 (50 CFR Part 402).
- Migratory Bird Treaty Act of 1918 (16 USC Parts 703-712).

Action-Specific State ARARs

- New Jersey Technical Requirements for Site Remediation (NJAC 7:26E)
- New Jersey Hazardous Waste Regulations (NJAC 7:26), Permitting, Contingency Plans, Specifications for Treatment/Disposal Units.
- New Jersey Pollutant Discharge Elimination System (NJAC 7:14A-1.1 et seq.), Permit/Discharge Requirements.
- New Jersey Soil Erosion and Sediment Control Act (NJSA 4:24-39).
- New Jersey Stormwater Management Rules (NJAC 7:8).
- New Jersey Surface Water Regulations (NJAC 7:9-5.1), Effluent Standards/Treatment Requirements.
- New Jersey Air Pollution Control Regulations (NJAC 7:27-16), Permits and Emissions Limitations for VOCs.

- New Jersey Air Pollution Control Regulations (NJAC 7:27-17), Toxic Substance Emissions.
- New Jersey Air Pollution Control Regulations (NJAC 7:27-12), Emergency Situations.

3.2.2.2. Potential TBCs

Federal TBCs

- Proposed RCRA Corrective Action Criteria (40 CFR Parts 265, 270, and 271), July 1990.
- Regional Screening Levels for Chemical Contaminants at Superfund Sites.
- USEPA Integrated Risk Information System (IRIS).
- USEPA Drinking Water Health Advisories.
- USEPA Health Effects Assessment Summary Tables.
- USEPA Superfund Technical Support Center's National Center for Environmental Assessment (NCEA).
- Toxicological Profiles, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service.
- Policy for Development of Water Quality-Based Permit Limitations for Toxic Pollutants (49 Federal Register 9016).
- Cancer Assessment Group (National Academy of Science) Guidance.
- Fish and Wildlife Coordination Act Advisories.

State TBCs

- New Jersey Water Supply Management Regulations (NJAC 7:19).
- New Jersey Air Pollution Control Regulations (NJAC 7:2-17).
- New Jersey Department of Environmental Protection Site Remediation Program Ecological Screening Criteria.
- "Derivation of New Jersey-Specific Wildlife Values as Surface Water Quality Criteria for: PCBs, DDT, and Mercury" (July 2001).

3.3. PRELIMINARY RISK ASSESSMENT

The purpose of this qualitative preliminary risk assessment is to assist in identifying additional data needs for completion of the BHHRA and ERA and in designing the RI sampling strategies. Conceptual site exposure models (CSEM) for human and ecological receptors for OU4 are formulated, preliminary COPCs and COPECs in surface water, sediment, floodplain soil, and biota are identified based on existing analytical data, and the results of the *Final Report, Ecological Evaluation for Cornell Dubilier Electronics Site, South Plainfield, New Jersey (1999 Ecological Evaluation)* (USEPA, 1999a) and the *Final Report Cornell-Dubilier Bound Brook Reassessment, South Plainfield, New Jersey* (2010 Reassessment) (USEPA, 2010) are summarized. Data collected during the OU4 RI will be used in conjunction with selected existing data to quantitatively evaluate the potential for human health risks and adverse effects to ecological receptors associated with exposure to chemicals in surface water, sediment, floodplain soil, and biota at OU4.

This assessment is based upon the current understanding of OU4, including the history of the former CDE facility, the extent and magnitude of chemical contamination, current and potential future land use, demography, hydrology, and other data presented in this Work Plan. The following information was prepared in general accord with the USEPA's *Risk Assessment Guidance for Superfund, Volume I, Human Health*

Evaluation Manual (Part A) (USEPA, 1989b) and *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (USEPA, 1997). These are companion documents to the USEPA's *Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA* (USEPA, 1988a).

Most of the existing analytical data for OU4 are for PCBs only, characterized as Aroclor mixtures. Based on the former CDE facility as a likely source of this contamination and the detected concentrations, PCBs are COPCs and COPECs in all environmental media. The only existing Target Compound List (TCL) and Target Analyte List (TAL) data for Bound Brook were collected to support the USEPA 1999 Ecological Evaluation, as described below. Analytical data for surface water, sediment, floodplain soil, and edible fish fillets collected during Phases II and III of this evaluation were tabulated and evaluated to identify preliminary COPCs and COPECs (other than PCBs) in each environmental medium, as described below. Data for reference areas were also tabulated for comparison but were not used to identify COPCs or COPECs. Additional COPCs and COPECs for OU4 include chemicals in OU2 soils that were found to be of concern in the BHHRA, the screening-level ERA and the preliminary baseline ERA (FWENC, 2002) and preliminary COPCs in OU3 groundwater (Malcolm Pirnie, 2008a).

3.3.1. Overview of USEPA's 1999 Ecological Evaluation

The objectives of the USEPA 1999 Ecological Evaluation were threefold:

- To investigate the nature and extent of contamination within Bound Brook downstream of the former CDE facility.
- To conduct an ecological risk assessment of a portion of Bound Brook and its associated floodplain downstream of the former CDE facility.
- To collect and analyze fish fillets from Bound Brook downstream of the former CDE facility for a human health risk assessment.

A preliminary investigation (Phase I) was conducted in May 1997 to determine the downstream extent of PCBs and metals in sediment and floodplain soil using screening methods and, based on the results, to select sampling locations between the former CDE facility and New Market Pond to be investigated in Phase II. Conducted in June 1997, Phase II involved the collection of surface water, sediment, floodplain soil, small mammals, crayfish, forage fish, and edible fish fillets for chemical analysis. The aquatic samples were collected at seven locations within Bound Brook and at a reference area upstream of the former CDE facility. The terrestrial samples were collected at three locations adjacent to Bound Brook and at a reference area located adjacent to Cedar Brook between Spring Lake and the confluence of Cedar Brook and Bound Brook. Based on preliminary Phase II data, Phase III was conducted in August 1997 to evaluate the downstream extent of contamination in Bound Brook. During Phase III, sediment and edible fish fillets were collected from three locations within Bound Brook between New Market Pond and the confluence with Green Brook and from one location in Green Brook just upstream of the confluence with the Raritan River. Depending on the sample type, analytes included VOC, base-neutral acid extractables (BNA), pesticides, PCBs, TCL metals, total petroleum hydrocarbons, ammonia, and other physicochemical parameters. During Phase II, sediment samples were evaluated in a 14-day toxicity test using the amphipod *Hyalella azteca* and livers and kidneys from the small mammals were submitted for histopathological evaluation.

3.3.1.1. **Results of 1999 Ecological Evaluation - Ecological**

The following overall conclusions were made based on the results of the 1999 Ecological Evaluation (USEPA, 1999a) in regard to the potential for adverse effects to ecological receptors:

- The structure and function of the stream ecosystem and stream corridor adjacent to and downstream of the former CDE facility is at risk from chemical contamination.

- The benthic community, fish, birds, and omnivorous mammals utilizing Bound Brook were found to be at risk from exposure to various VOCs, SVOCs, PCBs, pesticides, and metals.

- PCBs for omnivorous mammals and piscivorous birds and selenium for omnivorous mammals posed the most significant risks based on use of mean chemical concentrations and lowest observable adverse effects levels in the food web accumulation models.

- Ecotoxicologically-based remediation goals could not be developed due to lack of correlation between sediment concentrations and hazard quotients derived from food web accumulation modeling.

3.3.1.2. **Results of 1999 Ecological Evaluation – Human Health**

The following overall conclusions were made based on the results of the 1999 Ecological Evaluation (USEPA, 1999a) in regards to human health:

- The highest concentrations of PCBs in edible fish tissue were from carp, white sucker, pumpkin seed, and largemouth bass fillets.

- The highest concentrations of PCBs in fish were from samples collected downstream of New Market Pond. One possible explanation provided was the large size of carp samples and the limited number of carp collected, which may have lead to high variability.

- PCBs and pesticides were found in fish collected from Spring Lake, indicating a source upstream of Spring Lake. Nevertheless, the former CDE facility appeared to be a significant source of PCBs in edible fish tissue collected from Bound Brook downstream of the former CDE facility.

3.3.2. Overview of the USEPA's 2010 Reassessment

As stated in the 2010 Reassessment (USEPA, 2010), the objectives were to:

- Determine the total PCB, PCB congener and dioxin-like PCB concentrations in selected fish (sunfish and carp) and invertebrates (Asiatic clams), and compare with historical data from the Bound Brook;
- Re-establish the baseline concentrations of PCBs and dioxin-like PCBs in fish and invertebrate tissue within the Bound Brook for remedy effectiveness monitoring;
- Provide a fingerprint of the PCB congeners within the Bound Brook extending from the CDE Site to New Market Pond;
- Define the ecological receptors that actually exist in the Bound Brook system;
- Provide a focused ecological risk assessment (ERA) to evaluate the current PCB risks to selected assessment endpoints; and
- Provide data for and support to Baseline ERA being conducted in the RI/FS.

Fish (carp, white sucker, and sunfish species) and invertebrate (Asiatic clam) tissue samples were collected at many of the same sampling locations from the 1999 Ecological Evaluation. For fish samples, both fillet and offal tissues were analyzed. Tissue samples were analyzed for percent solids, percent lipids, and PCB Aroclors. A portion of the tissue samples were also analyzed for PCB congeners. Significant differences were noted for some sampling locations based on the comparisons with historical PCB concentrations. The comparisons suggest that loading of PCBs into the Bound Brook has declined since the 1999 Ecological Evaluation was conducted.

Based on graphical and statistical evaluation of the data, the 2010 Reassessment concluded the following:

- The reference area utilized in this study is outside of the direct influence of the CDE Site.
- The sampling station adjacent to the former CDE facility appears to contain a unique PCB congener pattern, representative of the former CDE facility.
- The sampling station just downstream of the former CDE facility has a unique PCB pattern which is the result of either an additional contributing source to the Bound Brook or the result of chemical fate and transport properties of the Bound Brook system. The data do not support conclusions regarding the relative strength of PCB sources (mass release rates).
- The unique PCB congener pattern found in Spring Lake supports a conclusion that another PCB source may exist in the Cedar Brook drainage.

The wildlife species investigation (Stantec, 2008) was conducted on several reaches of Bound Brook, from the Dismal Swamp to New Market Pond, in December 2008 as part of the 2010 Reassessment. A population of mink was conclusively determined to exist within the Bound Brook system. This investigation documented wildlife utilization of the Bound Brook within OU4, which is summarized further in Section 5.6.2.6.

The focused ecological risk assessment evaluated the current potential for risk to selected assessment endpoints. In assessing the survival, growth, and reproduction of fish, measured concentrations in fish tissue were found to exceed critical body burden data for PCBs at all sampling locations except the reference location. Food chain modeling for representative species was used to assess the survival, growth, and reproduction of birds and mammals based on exposure to PCBs in the diets of the wildlife receptors. The potential for risk associated with sediment and water intake was not evaluated for wildlife receptors.

Unacceptable risk was found for dietary exposure to dioxin-like PCBs and/or total PCBs (Aroclors) for all wildlife receptors at locations adjacent to and just downstream of the former CDE facility. Unacceptable risk was found for dietary exposure to dioxin-like PCBs and/or total PCBs (Aroclors) for piscivorous wildlife in New Market Pond, Spring Lake, and, under certain assumptions, the reference location.

The results support the conclusion that substantive ecological risk exists to fish and wildlife within the Bound Brook from exposure to PCBs. Estimated risks were higher for areas adjacent to and just downstream of the former CDE facility. The 2010 Reassessment concluded that the estimated risk to piscivorous mammals, like the mink, are of particular concern since dietary exposure may exceed severe effects levels and mink have been found utilizing the Bound Brook system.

3.3.3. Potential Source Areas and Release Mechanisms

As described previously, CDE apparently disposed of PCB-contaminated materials and other hazardous substances directly on soils at the former CDE facility. In addition, interconnected floor drains (from the recently demolished buildings) and storm water catch basins used at the former CDE facility are believed to have discharged to two locations along Bound Brook. Therefore, the primary source considered for OU4 is the former CDE facility; however, there may be other sources for many of the preliminary COPCs and COPECs.

The primary release mechanisms for chemical contamination at the former CDE facility may include:

- Direct release.
- Disposal of contaminated material.
- Surface runoff, including eroded soil, from the former CDE facility.
- The potential for contaminated groundwater to discharge to Bound Brook or its tributaries.

Secondary release mechanisms may include:

- Erosion of soil/sediment of stream banks along the Bound Brook corridor.
- Sedimentation and re-suspension in the water column.
- Scour of deposited sediments and hydraulic transport during storm events.
- Sorption and desorption from sediment and soil particles.
- Assimilation/bioaccumulation into biota.

These activities and release mechanisms apparently led to widespread chemical contamination at the former CDE facility, as well as the migration of chemicals to a variety of areas and environmental media throughout the Site, including adjacent residential, commercial, and municipal properties, the underlying groundwater, surface water, sediments, and biota in Bound Brook, and associated floodplain soils along the Bound Brook corridor.

3.3.4. Human Health Evaluation

A preliminary evaluation is made of the potential for exposure of human receptors to contamination within OU4, assuming that the surface water bodies are classified as FW2NT (refer to Section 3.1.2).

3.3.4.1. Preliminary Chemicals of Potential Concern

The preliminary COPCs were selected by comparing the analytical data to *2008 Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites* developed by Oak Ridge National Laboratory and used by the USEPA for this purpose and, where appropriate, to regulatory standards and criteria.

However, since RSLs are not available for surface water and sediment, RI data will be compared to RSLs for tapwater and residential soil, respectively, based on designated uses for Bound Brook and associated tributaries and impoundments. The surface water data were also compared to the National Recommended Water Quality Criteria (NRWQC) for the protection of human health from consumption of organisms only and the New Jersey Surface Water Quality Criteria (SWQC) for Toxic Substances, freshwater (FW2) criteria for human health. Floodplain soil data were compared to RSLs for residential soil and the NJDEP Soil Remediation Standards (SRS), residential direct contact. Tissue data from edible fish species were compared to RSLs for fish assumed to be consumed. The fish RSLs were obtained from the RSL calculator, accessed online at: http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search. The fish scenario and default SL type were selected.

The surface water, sediment, floodplain soil, and fish tissue data are presented in Table 3-5 and Tables 3-7 to 3-9, respectively; the frequency of detection and detected concentration range are presented. Identification as a preliminary COPC is based on the availability of toxicity values to derive the RSLs and comparison of the maximum detected concentration to the RSLs, NRWQC, SWQC, and SRS. Chemicals whose maximum detected concentrations exceed the screening levels, and detected chemicals without RSLs, are identified as preliminary COPCs. Consideration was not given to the frequency of detection.

The preliminary COPCs, based on the TCL/TAL data from the USEPA's 1999 Ecological Evaluation, are indicated in Table 3-5 and Tables 3-7 to 3-9. COPCs from this screening, chemicals of concern for OU2 soils, and preliminary COPCs for OU3 groundwater are summarized across all media in Table 3-10. A variety of VOCs, SVOCs, pesticides, and metals are identified as preliminary COPCs in one or more media.

3.3.4.2. **Conceptual Site Exposure Model**

The CSEM for potential exposure to chemicals in surface water, sediment, floodplain soil, and biota at OU4 is presented in Table 3-11. The CSEM will be updated over the course of the RI, as appropriate, as additional information is obtained and evaluated.

Potential exposure pathways include the environmental media of concern at OU4: surface water, sediment, floodplain soil, and biota. Potentially-exposed human receptors, currently and in the foreseeable future, include:

- Recreationists utilizing the Bound Brook corridor.
- Workers who may be involved in maintaining spillways and culverts along the Bound Brook corridor.
- Anglers who sport fish along the Bound Brook corridor.
- Residents and commercial/industrial workers who live or work within or in proximity to the floodplains along the Bound Brook corridor.

- Construction/utility workers who may be involved in subsurface activities within the floodplain soils along the Bound Brook corridor.

- Anglers/sportsmen who may consume aquatic organisms caught in Bound Brook or associated tributaries.

Depending on the environmental medium of concern, exposure routes could include incidental or intended ingestion, incidental dermal contact, and inhalation of volatile chemicals or chemicals associated with soil/sediment particles released to outdoor air.

3.3.5. Ecological Evaluation

In anticipation of evaluation of analytical data collected since the 1999 Ecological Evaluation and to be collected during the RI, COPECs were re-evaluated. This re-evaluation reflects recent changes to ecological screening values (ESVs) used to select COPECs and directs how analytical data collected since that evaluation will be used to further evaluate the potential for exposure of ecological receptors to contamination within OU4.

3.3.5.1. Re-evaluation of Chemicals of Potential Ecological Concern

Preliminary COPECs were selected by comparing analytical data from surface water, sediment, and floodplain soil to appropriate ESVs, as follows:

- The ESVs for surface water are the lower of the NRWQC for freshwater, the New Jersey Surface Water Quality Criteria for Toxic Substances, freshwater (FW2) criteria for protection of chronic exposure to aquatic life, the lowest of the freshwater values from the ORNL paper *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Aquatic Biota: 1996 Revision* (Suter and Tsao, 1996), and values presented in the paper developed by the USEPA, US

Fish and Wildlife and the NJDEP titled *Derivation of New Jersey-Specific Wildlife Values as Surface Water Quality Criteria for: PCBs, DDT, and Mercury, July 2001.*

- The ESVs for sediment include the lowest value from the following sources: the consensus-based sediment quality guidelines (MacDonald, 2000), the lowest of the freshwater values from the ORNL paper *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 Revision* (Jones et al., 1997), and the NJDEP Site Remediation Program Ecological Screening Criteria for sediment[11].

- The ESVs for floodplain soil are the lower of the USEPA Ecological Soil Screening Levels[12], the USEPA Region 5 Ecological Screening Levels.[13], and the NJDEP Site Remediation Program Ecological Screening Criteria for soil[14].

The surface water, sediment, and floodplain soil data are presented in Tables 3-6 to 3-8; the frequency of detection and detected concentration range are presented. Identification as a preliminary COPEC is based on available ESVs and comparison of maximum detected concentrations to the ESVs. Chemicals whose maximum detected concentration exceeds the ESV and detected chemicals without ESVs are identified as preliminary COPECs, as shown in Tables 3-6 to 3-8. Preliminary COPECs from this screen, chemicals found to contribute significantly to risks estimated in the 1999 Ecological Evaluation and the 2010 Reassessment, chemicals of concern for OU2 soils, and preliminary COPCs for OU3 groundwater are summarized across all media in Table 3-10.

[11] Accessed online at: http://www.nj.gov/dep/srp/guidance/ecoscreening/
[12] Accessed online at: http://www.epa.gov/ecotox/ecossl/
[13] Accessed online at: http://www.epa.gov/reg5rcra/ca/edql.htm
[14] Accessed online at http://www.nj.gov/dep/srp/guidance/ecoscreening/

Various VOCs, SVOCs, pesticides, and metals are identified as preliminary COPECs in one or more media.

Tables 3-7 and 3-8 also indicate whether each detected chemical has been identified as a bioaccumulative substance by the USEPA's Persistent, Bioaccumulative, and Toxic (PBT) Chemical Program[15] or by the State of Washington Department of Ecology's PBT initiative[16]. Because the ESVs for floodplain soil incorporate protection of animals that may consume biota that live in or on the soil, comparison of maximum detected chemical concentrations to the ESVs considers the potential for adverse effects from bioaccumulative chemicals. The ESVs for sediment, on the other hand, are protective of sediment-dwelling organisms and may not be protective of higher trophic-level organisms (*i.e*., fish, birds, and mammals). However, as shown in Table 3-7, most chemicals considered to be bioaccumulative have been identified as preliminary COPECs in sediment. The potential for adverse effects in higher trophic-level organisms from direct exposure to sediment and ingestion of chemicals in sediment that have bioaccumulated in their dietary items will be evaluated further in the ERA.

3.3.5.2. **Ecological Conceptual Site Exposure Model**

The ecological CSEM is based on current understanding of the environmental setting, known and suspected chemical contaminants, fate and transport mechanisms, and potential ecological receptors. The ecological CSEM for OU4 is provided as Figure 3-16. Like the CSEM for the human health evaluation, the ecological CSEM will be updated over the course of the RI, as appropriate, as additional information is obtained and evaluated.

Potentially complete exposure pathways include ecological receptors that may contact the environmental media of concern at OU4: surface water, sediment,

[15] Accessed online at: http://www.epa.gov/pbt/
[16] Accessed online at: (http://www.ecy.wa.gov/programs/swfa/pbt/rule.html

floodplain soil, and biota. Potentially-exposed ecological receptors, currently and in the foreseeable future, include:

- Aquatic plants, benthic invertebrates, freshwater fish, semi-aquatic birds and mammals, and reptiles and amphibians potentially exposed to COPEC in surface water and/or sediment.

- Terrestrial plants, invertebrates, birds, mammals, and reptiles and amphibians potentially exposed to COPEC in floodplain soil.

- Terrestrial birds and mammals that may use Bound Brook and its tributaries and impoundments as a water source.

Potential routes of exposure include ingestion, dermal contact, respiration (fish), and uptake.

3.4. SUMMARY OF ADDITIONAL DATA NEEDS

Additional data are needed to further characterize the nature and extent of sediment and soil contamination and the extent of the remaining capacitor debris; describe contaminant fate, transport, and bioavailability; support the human and ecological risk assessments; develop remediation goals and identify and evaluate potential remedial alternatives. The study questions and data inputs identified for the RI/FS are described in the DQO Attachment to the QAPP (Louis Berger, 2010b). The following actions are proposed to generate the necessary data inputs:

OU4 Land Surveying, Geotechnical Coring, and Geophysical Survey

- Aerial mapping may be conducted to generate topographic data and prepare base maps for RI data presentation, FS evaluations, and habitat surveys.

- Bound Brook cross-sections will be surveyed at regularly-spaced transects (and at important features such as culverts, confluences with tributaries) to provide input to potential hydrodynamic modeling and FS evaluations.

- Land surveying will also be conducted to locate sediment, soil, and water column sampling locations (individual samples, transects, and gridded areas).

- Side Scan Sonar (SSS) and bathymetric surveys will be conducted in New Market Pond, with confirmatory near-surface sediment sample collection and grain size analyses to interpret the SSS imagery. The objective is to obtain sediment texture information from New Market Pond.

- Sediment depth (and to some degree, texture) will be mapped by probing on regularly-spaced transects in Bound Brook (two locations per transect) and at regular intervals along the SSS survey tracklines in portions of New Market Pond.

- Geotechnical sediment cores will be collected for sediment visual classification and physical properties analyses from 28 transects in Bound Brook (two cores per transect) and 3 transects in New Market Pond (3 cores per transect).

- A geomorphic assessment of selected reaches of the channel may be performed. If collected, the data will be used to assess the likelihood of future erosion of contaminated sediments and bank soils.

Nature and Extent of Sediment and Soil Contamination

- High resolution sediment cores will be collected from four target areas in Bound Brook, New Market Pond, and Cedar Brook to characterize the depositional chronology of contamination in OU4. The high resolution sediment cores will be processed into 20-40 segments, which will be individually analyzed for radionuclides and potential OU4 contaminants.

- Low resolution sediment cores will be collected from regularly-spaced transects in Bound Brook (two cores per transect), New Market Pond (three cores per transect), in each of the three unnamed tributaries to Bound Brook in OU4 and Cedar Brook to characterize the vertical and horizontal extent of sediment contamination. The low resolution sediment cores will be processed into 6-inch segments that will be individually analyzed for chemical parameters.

- Floodplain soil borings will be collected along transects in OU4 (with one boring every 100 feet, beginning at the edge of the brook and extending along the transect deeper into the floodplain) and from designated investigation areas (on a 200-foot grid) to characterize the vertical and horizontal extent of soil contamination. The soil borings will be processed into 1-foot sample intervals with initial analysis of the 0-1 ft and 1-2 ft below grade samples for chemical parameters and physical properties. Deeper samples (up to 4 feet below grade) will be archived frozen and may be submitted for analysis if necessary to characterize the vertical extent of floodplain contamination.

- Additional soil borings will be advanced at the locations of the test pits excavated in May 2008 (refer to Section 2.2.3.6). Soil samples will be collected for analysis from these borings to evaluate the vertical extent of contaminated soil below capacitor disposal areas located in the banks of Bound Brook and proximal to OU2.

Hydrodynamic Data Collection

- A field geology survey will be conducted to visually identify outcrops and fracture zones that indicate discharge of groundwater to Bound Brook.
- Stream flow and water quality parameters will be measured to identify potential areas of groundwater contribution.
- Hydrodynamic data will be obtained over a period of approximately 1 year using ultrasonic water level meters installed at locations to be determined during the stream flow survey, and transducers installed at the outlets of Spring Lake and New Market Pond.
- Piezometers and staff gauges may be installed adjacent to Bound Brook to measure groundwater elevations, if necessary to calibrate the model for groundwater discharge to Bound Brook.
- Hydraulic conductivity may be measured at piezometer locations using slug tests or other methods.

Porewater Sampling

Porewater sampling will be performed if the results of the stream flow survey support the potential for transport of contaminated groundwater into Bound Brook.

Surface Water Sampling

- Surface water samples will be collected from selected locations in Bound Brook, New Market Pond, and Cedar Brook to characterize the transport of particle-associated and dissolved contamination in OU4 during base flow conditions and address the risk assessment data needs. These locations will be determined following evaluation of groundwater discharge to Bound Brook. Proposed locations are not intended to be co-located with sediment samplings locations, and are shown on Figures 5e through 5h.

- Two rounds of grab sampling will be conducted under base flow conditions.

Sediment Trap Sampling

Sediment traps will be deployed for a 2-4 week period at selected locations in Bound Brook, New Market Pond, the unnamed tributaries, and Cedar Brook to characterize sediments transported in the water column under varying conditions, including base and storm flow. A subset of these locations will be co-located with the selected surface water sampling stations. The collected sediments will be submitted for chemical analysis.

Additional Risk Assessment Data Needs

Sediment, surface water and floodplain soil data will be collected to support the risk assessments and to further characterize the nature and extent of contamination in OU4 via the programs described above. Fish consumption by anglers and sportsmen will be evaluated in the BHHRA basedon fillet data previously collected by USEPA's Environmental Response Team (ERT) in 1997 and 2008. Consequently no additional fish tissue data are proposed for the RI at this time. However, additional data are needed to quantify the potential risk to human health and the environment. Other data needs to support the risk assessments include:

- An informal survey of preferred fishing locations and species caught and consumed. This survey will be accomplished by contacting local and state fish and wildlife management agencies, by direct observation during RI field activities, and/or by conferring with local anglers. A checklist of questions that the surveyor will use to verbally query the anglers/sportsmen is provided in Attachment 2. Attempts will be made to query local anglers/sportsmen during four days. This effort will occur over time, attempting to encompass seasonal (i.e., spring, summer, fall) and daily (i.e., weekdays, weekends, early mornings, late afternoons/early evenings) patterns. The objective is to obtain local information on consumption frequencies, consumption preferences, and preparation and cooking methods.

- Sediment toxicity testing to provide an additional line of evidence for the evaluation of the protection and maintenance of survival, growth, and reproduction of benthic invertebrate community. Acute and chronic toxicity tests on two species (*e.g.*, *Hyalella azteca* and *Chironomus tentans*) are recommended. The acute and chronic tests on *Hyalella azteca* will be 10-day and 42-day tests, respectively. The acute and chronic tests on *Chironomus tentans* will be 10-day and 50- to 65-day tests, respectively. The sediment used in the tests will be analyzed for the COPECs.

- Whole-body residue data for terrestrial invertebrates are needed for food web accumulation modeling of insectivorous birds and small mammals. Soil samples will be collected, analyzed for PCB congeners, and used in 42-day bioaccumulation tests with a terrestrial oligochaete species (*e.g., Eisenia fetida*) to measure whole-body residue for input to food web accumulation modeling.

- Whole-body residue data for benthic invertebrates are needed for food web accumulation modeling of omnivorous birds and small mammals. Although whole body residue data are available for crayfish, an infaunal species (*e.g.*, *Lumbriculus variegatus*) is more directly exposed to sediments. Sediment samples will be collected, analyzed for PCB congeners, and used in 28-day bioaccumulation tests with an infaunal species to measure whole-body residue for input to food web accumulation modeling.

- Limited physical/chemical data are needed to aid in identification of one or more suitable reference locations. In order to determine suitable locations to collect sediment and floodplain soil for bioaccumulation and toxicity testing, a better understanding of substrate and depositional areas is required. Therefore, sampling locations for these tests will be determined following reconnaissance and geotechnical and geophysical surveys.

3.5. IDENTIFICATION OF PRELIMINARY REMEDIAL ACTION OBJECTIVES

Section 121(b) of CERCLA indicates a preference for remedial actions that permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, and chemicals. The remedial action must be protective of human health and the environment, be cost effective, and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

The purpose of this section of the Work Plan is to identify potential remedial action objectives for soil and sediment contamination and a preliminary range of remedial action alternatives and associated technologies. It is a general classification of potential remedial actions based upon the initially identified potential exposure pathways and associated receptors identified in Section 3.3.

3.5.1. Preliminary Objectives

The remedial action objectives provide a general description of what the cleanup is expected to accomplish and help focus the development of remedial alternatives in the FS. The preliminary remedial action objectives for OU4 include:

- Reduce cancer risks and non-cancer health hazards for people eating fish from Bound Brook by reducing the concentration of COPCs in fish.
- Reduce the risks to ecological receptors by reducing the concentration of COPECs in biota.
- Reduce the inventory (mass) of COPCs and COPECs in sediments that is or may become bioavailable or presents risk to human health or to ecological receptors.
- Reduce the mass of contaminated sediments and buried capacitor debris that may be mobile (*e.g.,* unstable or erosional) and acting as a continuing source of contamination to OU4.
- Reduce the inventory (mass) of COPCs and COPECs in sediment such that releases to the water column do not present risk to human health and/or ecological receptors.

3.5.2. Preliminary General Response Actions

To meet the above preliminary remedial action objectives, a set of general response actions was identified. The general response actions that meet the above objectives fall into the following categories:

- No action.
- Limited action (institutional controls only).

- Monitored Natural Recovery (MNR).

- Containment. This will include capping of soils and sediments.

- Stream reconfiguration or hydrodynamic improvements to reduce the potential for scour/erosion of contaminated sediment and bank soils.

- Removal (*e.g.*, capacitor debris, contaminated sediments, and contaminated floodplain soils).

- Treatment.

The development, screening, and detailed analysis of remedial alternatives are discussed in Sections 5.9 and 5.10.

3.6. NEED FOR TREATABILITY STUDIES

At this time, the need for a treatability study cannot be assessed. Depending on the alternatives evaluated in the FS, a treatability study may be needed to prove the effectiveness of the recommended technology. Any treatability study will be conducted at the direction of USACE and USEPA.

3.7. INTERIM REMEDIAL ACTIONS

USEPA conducted an interim action in 2008 to stabilize Bound Brook bank soils in areas where erosion was exposing buried capacitor debris. No further interim remedial actions are proposed at this time, based on available data. If RI field activities reveal conditions that indicate the need for interim action, interim remedial actions will be proposed to USACE and USEPA at that time.

4. WORK PLAN RATIONALE

4.1. WORK PLAN APPROACH

The main objectives of the RI are to characterize the nature and extent of OU4 sediment and soil contamination, identify fate and transport mechanisms and potential receptors, to update the conceptual site model (CSM), and to develop human health and ecological risk assessments for OU4.

The recommended overall approach to conducting this RI includes:

- Evaluation of existing data.
- Determination of additional data needs.
- Data collection activities.
- Sample analysis and validation.
- Data evaluation.
- Determination of necessity for additional data/treatability studies.
- Assessment of baseline human health and ecological risks.
- Report preparation.

4.2. DATA QUALITY OBJECTIVES

The DQO process is a tool used to assure the quality and sufficiency of data collection in order to enable defensible decision-making. The DQO process addresses study objectives, data collection, and limits on decision errors. Implementation of the DQO process involves a seven-step effort that generates a set of quantitative and qualitative statements pertaining to data collection activities (USEPA, 2000a).

The DQO process guides the generation of data that are acceptable for the intended use of the data and assures precision, accuracy, reproducibility, comparability, and completeness. The DQO process, as it pertains to the OU4 RI, is discussed in Attachment 1.1 of the QAPP.

The FSP and the QAPP outline the detailed sampling and analytical procedures for each medium to be sampled, the number and type of each sample and the Quality Assurance/Quality Control (QA/QC) sample requirements for each medium. The DQOs for each sample type are identified in the QAPP based on the required analytical sensitivity for the intended use of the data. The QAPP identifies precision, accuracy and completeness goals used in selecting the sampling and analysis methods. The FSP contains details of field activities, such as Standard Operating Procedures (SOPs) for sediment core collection and processing. These documents are submitted under separate cover from this Work Plan.

5. RI/FS TASKS

5.1. PROJECT PLANNING

The project planning task involves several subtasks that must be conducted to develop the plans and corresponding schedule necessary to execute the RI/FS. These subtasks include conducting an analysis of existing data and identifying data gaps, reviewing existing project plans, conducting a site visit, developing a preliminary risk assessment (using existing data), developing DQOs, identifying preliminary ARARs, and identifying preliminary remedial action objectives. All of these activities culminate in the preparation of the final project plans. The evaluation of existing data, preliminary identification of ARARs, development of the preliminary risk assessment, identification of remedial action objectives and alternatives, as well as development of DQOs, are presented in Sections 3 and 4 of this Work Plan.

The project plans include this Work Plan, as well as the QAPP (with attached FSP), QCP, SSHP, and the Cultural Resources Work Plan (CRWP). The latter plans are submitted under separate cover.

5.2. COMMUNITY RELATIONS

The USEPA will develop a community relations program and coordinate community relations support for the Site. The USACE and the Project Team will provide assistance to USEPA, as requested.

5.3. FIELD INVESTIGATION

The RI field investigation will generate valid data to fill data gaps in the historical dataset and enable preparation of the RI/FS documents. The RI data will be used to evaluate the overall nature and extent of sediment, soil, and surface water contamination at OU4 so that an evaluation of remedial alternatives can be completed.

The data will also be used to assess migration pathways, identify potential receptors, and evaluate potential human health and ecological risks.

Three phases of field work are planned for the OU4 RI:

- Phase 1: Land surveying to locate probing and geotechnical sediment core transects, geophysical and geotechnical surveys, and initial hydrodynamic data collection via field geology and stream flow surveys.

- Phase 2: High resolution core collection and continuation of hydrodynamic data collection via installation of water level meters and transducers.

- Phase 3: Land surveying (to locate samples and to determine Bound Brook cross-sections), low resolution sediment core collection, floodplain boring collection, continuation of hydrodynamic data collection, surface water sample collection, sediment trap sampling, surface sediment and soil sampling to support the risk assessment, surface sediment and soil sampling for habitat characterization, and cultural resources survey. Optional tasks that could be conducted during Phase 3 of the RI include porewater sampling, geomorphic assessment of selected areas in Bound Brook, and measurement of groundwater elevation.

- Aerial mapping is designated as an optional task and is not currently scheduled in a particular phase of field work.

Adjustments to the RI task planning will be made, if needed, following the completion of each phase and evaluation of the associated data.

5.3.1. Subcontracting

Subcontractors will be utilized for the performance of specific work activities associated with the RI. The Louis Berger Group, Inc. (Louis Berger) will coordinate with the USACE Program Manager (PM) to verify that only responsible and reputable businesses are retained to conduct work on the project. Louis Berger strives to identify appropriate small businesses (preferably minority and/or woman owned businesses) in an effort to satisfy established small business subcontracting goals.

To support the proposed field activities, the following potential subcontracts will be required:

- A surveying subcontract for the locations of Bound Brook cross-sections and sampling transects.
- An aerial surveying subcontract for the mapping of OU4, as necessary.
- A geophysical and vibracoring subcontract for the New Market Pond SSS survey, bathymetric survey, probing, geotechnical coring, and high and low resolution sediment coring.
- A geophysical subcontract for utility mark-out
- A drilling subcontract(s) for direct push and/or hollow stem auger soil sampling in the flood plain and in the areas of buried capacitor debris proximal to OU2.
- A laboratory subcontract for non-CLP (non-Contract Laboratory Program) analytical services.
- A waste disposal subcontract to remove all investigation-derived wastes (IDW, both solid and liquid) generated during the RI.

- A subcontract for data validation services for validation of non-CLP data.

Selection of subcontractors will be achieved utilizing The Louis Berger Group, Procurement Manual: Purchasing and Subcontracting Business Policy and Procedures; and the Delegation of Responsibility and Authority Manual. To ensure compliance with the aforementioned manuals, Authorized Procurement Representatives will utilize the software programs Alloy and SharePoint to track and manage procurements. Any subcontract or purchase order with a dollar value less than $3,000 will be referred to as a “Micropurchase”. Micropurchase awards will be based on the reasonableness of the supplier’s offer and competition will be sought to the maximum extent practicable. Subcontracts in excess of $3,000 but not exceeding $100,000 will be referred to as “Simplified Acquisitions” and will be solicited using a competitive bidding process among at least three firms who are believed to be responsible and responsive. Goods and services utilized in support of project requirements that have a cumulative value in excess of $100,000 will be referred to as “Major Acquisitions”. At or above this monetary level, all acquisitions will utilize greater detailed source selection decision-making criteria. Individual methodology will be based on sound business practices. Certain subcontracts may need to be issued on a sole-source procurement basis due to the proprietary nature of the technology involved or significant previous Site experience; justifications for such subcontracts will be submitted to the Client for review and approval prior to execution.

5.3.2. Mobilization and Demobilization

This subtask will include field personnel orientation, equipment mobilization, surveying and marking/staking sampling locations, utility mark-outs (New Jersey One Call System), checking the mark-out ticket against the utility markings (flags) at each drilling location, and demobilization. Each field team member will attend an orientation meeting to become familiar with the project health and safety requirements, and field procedures. USEPA will be responsible for obtaining all property access permissions required to conduct the sampling. As directed by the USACE and the USACE, Louis Berger may assist in obtaining property access. Refer to Section 3.2 of the FSP (Louis Berger, 2010b).

Equipment mobilization will entail securing all sampling equipment needed for the field investigation. Equipment not available through Louis Berger will be leased, purchased, or if necessary, fabricated. A check of available Louis Berger equipment will be conducted prior to initiating field activities. Any equipment that is needed but is not available in the inventory will be secured after notification of, and approval by, the USACE. A government property management and inventory system will be utilized to manage all consumable and durable equipment purchased for the project. Equipment mobilization may include (but will not be limited to) sampling, health and safety, and decontamination equipment and supplies.

The locations of proposed floodplain soil borings on public and private property will be marked in white paint one week before the start of work. New Jersey's One Call System will be called and asked to mark the location of all utilities near each proposed soil and sediment sampling location on public property. A copy of the Mark-Out ticket will be obtained and kept with the field team leader during drilling activities. Three full working days after the call, each proposed sampling location will be visited to make sure that each utility on the Mark-out ticket has identified their utilities in the area. Utilities identified on the Mark-Out ticket but not identified at each location will be contacted to confirm they do not have any utilities in the area. New Jersey's One Call System will not identify utilities on private property. A geophysics subcontractor will perform a non-invasive survey (*e.g.*, magnetic, resistivity) to mark-out utilities at the proposed soil sampling locations on private properties.

Equipment will be decontaminated and demobilized at the completion of all field activities or during the course of the field investigations, as appropriate. Personnel, investigation equipment, and large equipment (*e.g.*, drilling equipment) that require decontamination will be decontaminated in the contamination reduction zone identified by the requirements of the SSHP. In addition, the disposal of all investigative-derived waste (IDW) (*e.g.*, decontamination solutions, excess sediment, soil cuttings) will be conducted during demobilization. Transportation and off-site disposal of any wastes generated during the RI field activities that are determined to be hazardous will be carried out by a subcontractor to Louis Berger. For more information on IDW disposal, refer Section 15 of the FSP (Louis Berger, 2010b).

5.3.3. Aerial and Land Surveys

Aerial and land surveys will be conducted to map local topography, characterize the physical features of Bound Brook, and locate sampling stations. The following data needs will be met:

- Evaluate Bound Brook's configuration and geomorphology.
- Determine the grades of the side slopes of the Bound Brook and tributaries to support FS evaluations and modeling.
- Develop hydraulic analyses.
- Support feasibility analyses and evaluation of remedial alternatives.
- Determine site access and locations of utilities and other pertinent features.

Land surveys will be conducted to map cross-sections of Bound Brook, lay out sampling transects and grids, and to obtain data, develop mapping, and understand constraints for portions of OU4 not already addressed by existing data and the aerial survey.Aerial surveys are an optional task. If conducted, Digital Ortho Photography (aerials) will be obtained to extend mapping outside the channel of the Bound Brook and upland adjacent areas.

5.3.4. Geophysical Survey of New Market Pond

A geophysical survey will be conducted to support characterization of the nature of the surface sediment texture in New Market Pond, where a survey boat can be launched to provide a more rapid and comprehensive investigation. The data needs for the geophysical survey are as follows:

- Assess the texture of the surficial and subsurface sediment to support site characterization for contaminant fate and transport, benthic habitat assessment, and remedial alternative evaluation.

- Identify the significant stratigraphic/depositional layers of the sediment to support subsequent high and low resolution coring investigations and engineering analyses.

- Identify potential sediment scour/deposition areas.

- Provide information associated with delineation of in-river habitats, including near-shore and submerged aquatic vegetation beds.

- Estimate the amount/extent of dumping/debris and other features in Bound Brook to evaluate the feasibility of remedial activities (*e.g.*, sediment removal, capping).

- Select the target locations and depths of high resolution and low resolution sediment cores that will be collected for chemical analysis.

- Determine bathymetry of New Market Pond.

The geophysical survey will consist of a single-beam SSS survey to characterize and map sediment texture and a bathymetric survey to determine water depths in New Market Pond. SSS provides mosaic images of the surface sediment in the investigation area. Resolution is expected to be approximately one square foot/pixel or finer. Confirmatory sediment coring (shallow push cores) will be conducted to calibrate and verify the results of the geophysical investigation and provide geotechnical information for the sediments. The confirmatory sediment cores will be approximately 2 feet deep and collected at a spacing to be specified by the geophysical subcontractor. Probing will also be conducted along the SSS survey tracklines in portions of the pond at a spacing to be determined.

These data will be used to delineate areas of fine- and coarse-grained sediments, areas of sedimentary bedforms indicative of potential sediment erosion and deposition, and benthic habitat. These data will also be used as a guide for placement of additional sediment cores to delineate the extent of contamination, and in characterizing aquatic habitats. Detailed procedures for geophysical surveys are provided in Section 5.2 of the FSP.

5.3.5. Geotechnical Survey

The geotechnical survey will consist of probing and geotechnical core collection. The length of the proposed study area is 7.5 miles.

Probing will be conducted to determine the depth of the unconsolidated sediments and inferred sediment texture, with these data recorded on probing logs. Probing will be conducted on transects spaced every 100 feet in the main channel of Bound Brook, with two probing locations on each transect. Probing in New Market Pond will be conducted along SSS survey tracklines. Sampling locations are shown on Figures 5-3a through 5-3d.

Geotechnical sediment cores will be collected to characterize the sediment texture and physical properties in Bound Brook and New Market Pond. The sediment cores will be used to create sediment texture maps and stratigraphic cross-sections in OU4 and also to support interpretation of the geophysical survey data discussed in Section 5.3.4. The data from the geotechnical investigation will be used to address the same objectives described in Section 5.3.4.

The geotechnical cores will be advanced to refusal to examine sediment stratigraphy throughout the unconsolidated sediment column. The cores will be advanced on transects spaced 0.25 miles apart using any of various techniques, as needed, including push coring, piston coring, and vibracoring. The cores will be advanced until refusal or pre-industrial sediments are encountered, so that each potentially contaminated stratum can be visually classified (*i.e.*, using ASTM and Unified Soil Classification System soil descriptions) in the field.

Two or three cores will be collected from each transect. The location of individual transects may be adjusted at the discretion of the field team to investigate sediment texture boundaries observed visually during field work. Geotechnical cores may be 2 to 6 feet in depth.

Detailed procedures for collection and processing of geotechnical sediment samples are provided in Section 5.3.2 of the FSP.

5.3.6. Stream Classification Survey

Steam classification survey is currently an optional task. If conducted, the survey will focus on specific reaches of the channel that contain the majority of the contaminated sediment inventory to determine the processes at work and assess the likelihood of future erosion of contaminated sediments and bank soils. A standard methodology, such as Rosgen's Stream Channel Stability Assessment, will be followed for the assessment. Details on the selected methodology will be presented, as necessary, in an addendum to the planning documents.

5.3.7. High Resolution Sediment Coring

The main goal of this program is to provide data on current and historical COPC/COPEC transport and fate and to identify the full suite of contaminants discharged to OU4, via an examination of the sediment record in areas of continuous sediment deposition, if such areas can be located. The high resolution sediment coring program will also provide data on long term contaminant stability and persistence in the sediments. The specific data needs to be addressed in this program include:

- Recent trends in COPC/COPEC concentrations in sediments and, by inference, recent trends in mean annual water column COPC/COPEC concentrations. The results can be interpreted both as in-situ sediment data and as a chronological record of recent and historic water column transport of contaminated sediments that created the depositional areas to be cored.

- Nature and general location of current sources of COPCs/COPECs to Bound Brook (*e.g.*, by tributary or major feature of OU4).

- Nature and general location of historical input of COPCs/COPECs to Bound Brook (*e.g.*, by tributary or major feature of OU4).

- Rate of in-situ chemical degradation in Bound Brook sediments.

- Anticipated residence time for COPCs/COPECs in the sediments.

- Geochemical processes affecting sediment COPC/COPEC levels, as well as fate and transport and bioavailability of COPCs/COPECs.

- Burial rate and age progression with depth of sediment using long-lived radionuclides.

- Presence of recent deposition (less than 6 months old) using short-lived radionuclides (*i.e.*, Beryllium-7).

High resolution cores will be collected from areas of relatively continuous fine-grained sediment deposition, if they can be located, in the following proposed areas:

- Near the upstream boundary of OU4.

- Downstream of and proximal to the former CDE facility in Bound Brook.

- Cedar Brook (upstream of Spring Lake)

- New Market Pond.

Specific core collection locations within these areas will be selected based on information obtained from the land surveys (Section 5.3.3) and sediment probing (Section 5.3.5).

High resolution cores will be analyzed for both radionuclide and chemical parameters. To achieve the data needs, the radionuclide profile (concentration vs. depth) must be indicative of continuous deposition (*i.e.*, a “dateable” core). In order to obtain one dateable core from each location identified above, it may be necessary to collect as many three cores from each of the four areas (a total of 12 cores), with initial radionuclide analyses only to identify the dateable cores for subsequent chemical analysis.

As discussed in Section 3.1.3, New Market Pond was dredged during the 1980s and available documentation does not include maps of the dredging areas. Location of a high resolution core in New Market Pond may still be possible based on review of the

New Market Pond SSS, bathymetry, and geotechnical data to be generated in the first phase of the RI field investigations.

Cores will vary in length. The target locations of high resolution sediment cores and the core segmentation will be determined based on: geochemical evaluation of historical data, geotechnical investigations, SSS survey results, and information from other site reconnaissance.

Each high resolution core will be segmented into 20 to 40 slices representing from 1 to 5 years of deposition for individual analysis, as estimated based on changes in sediment color or texture observed visually in the field. Detailed procedures for high resolution core collection and processing are provided in Section 6.2 and 6.3 of the FSP. General target locations for high resolution cores are shown on Figures 5-3e through 5-3h.

5.3.8. Low Resolution Sediment Coring

A low resolution sediment coring investigation will be conducted to broadly characterize sediment contamination extent for the RI. The objectives for the low resolution sediment coring program include:

- Delineation of the horizontal and vertical extent of sediment COPC/COPEC concentrations within Bound Brook.
- Collection of chemical data for risk assessment preparation.
- Investigation of previously unknown or incompletely documented areas of sediment COPC/COPEC contamination.
- Further investigation of the physical properties of the sediments within Bound Brook.

- Input to potential numerical models to be used to characterize sediment transport and contaminant fate and transport.

Low resolution sediment cores will be collected on transects in Bound Brook as shown on Figures 5-3e through 5-3h, with two to three cores advanced on each transect. (Upland borings advanced along each transect are addressed in Section 5.3.9). Two low resolution cores will be advanced on each of the three unnamed tributaries to Bound Brook in OU4 and on Cedar Brook. Potential further investigation of the unnamed tributaries will be based on evaluation of the results from the initial two low resolution cores on each tributary. Transect spacing takes into account the availability of historic data and distance from the former CDE facility. In areas previously sampled, confirmatory cores will be advanced to:

- Target varying contaminant concentrations in the historic data set (from the lower to the upper limits of the detected ranges).
- Explore various spatial characteristics of the known contaminant nature and extent (centers of known “hotspot” areas and fringes of contaminated areas).
- Supplement the dataset where previous cores were discontinuous (*e.g.*, only the 0-6 inch and 18-24 inch segments were sampled) or did not completely penetrate the full depth of contaminated sediment.
- Obtain data on additional COPCs/COPECs not previously analyzed but required for risk assessment or other site characterization purposes.

Low resolution sediment samples will be collected via vibracoring, push coring, or piston coring, as necessary to obtain adequate recovery and retrieve representative sediment samples. The initial coring technique used will initially be selected based on the physical characteristics of the sediments and may be field-adjusted based on actual conditions encountered.

Each low resolution core will be processed into 6-inch segments with each segment analyzed for a variety of chemical and physical parameters, based both on risk assessment data needs and the findings of the high resolution coring program regarding the identity of contaminants historically released into OU4. Further information regarding core locations, spacing, target depth, and the final segmentation scheme is provided in Section 7 of the FSP (Louis Berger, 2010b). These parameters will be initially determined based on geochemical analysis of existing core data, and adjusted as appropriate based on geotechnical and geophysical surveys, results of the high resolution coring program, and field conditions observed during the low resolution coring program itself.

5.3.9. Floodplain Soil Borings

A floodplain soils investigation will be conducted to broadly characterize the extent of soil contamination for the RI. The objectives for the floodplain soil boring program include:

- Delineation of the horizontal and vertical extent of soil COPC/COPEC concentrations within the OU4 floodplain.
- Collection of chemical data for risk assessment preparation.
- Investigation of previously unknown or incompletely documented areas of sediment COPC/COPEC contamination.
- Further investigation of the physical properties of the floodplain soils within OU4.

Floodplain borings will be collected on upland transects and specific grid locations in OU4 as shown on Figures 5-3e through 5-3h. (Sediment cores collected on each transect are addressed in Section 5.3.8.)

Borings will be advanced on a 200 ft by 200 ft grid within specific floodplain investigation areas wherer PCBs were previously detected near the confluence of Bound Brook and Cedar Brook (*i.e.*, between historic Areas 2 and 3 on the north bank of Bound Brook, and south of historic Areas 1-3 on the south bank of Bound Brook) and northeast of the former CDE facility in the marshy area on the south bank of Bound Brook. Transect spacing takes into account the availability of historical data and distance from the former CDE facility. In areas previously sampled, confirmatory borings will be advanced to:

- Target varying contaminant concentrations in the historical data set (from the lower to the upper limits of the detected ranges).
- Explore various spatial characteristics of the known contaminant nature and extent (centers of known “hotspot” areas and fringes of contaminated areas).
- Supplement the dataset where previous cores were discontinuous (*e.g.*, only the 0-6 inch and 18-24 inch segments were sampled) or did not completely penetrate the full depth of contaminated soil.
- Obtain data on additional COPCs/COPECs not previously analyzed but required for risk assessment or other site characterization purposes.

Floodplain boring locations will be biased toward depositional zones, as appropriate. These zones will be identified using any or all of the following methods:

- Review of aerial photographs documenting significant historic flooding events (as available).

- Evaluation of topography and flooding maps.

- Observations of the floodplain and stream banks gathered during land (Section 5.3.3) and stream flow (Section 5.3.10) surveys.

- Anecdotal information from the USACE-NYD or local municipalities.

All requests for information from other agencies or local municipalities will be routed through the USACE-KCD and USEPA for prior approval.

Once depositional areas have been identified, final floodplain boring locations will be selected. Statistical software (*e.g.,* Visual Sampling Plan) may be used in the selection process. These locations will be submitted to the USACE-KCD and USEPA for approval to finalization.

Floodplain boring samples will be collected via hand augering, direct push soil sampling, or hollow stem auger drilling, as necessary to obtain adequate recovery and retrieve representative soil samples to a depth of up to 4 feet below grade. The initial drilling technique used will be selected based on the physical characteristics of the sediments and may be field-adjusted based on actual conditions encountered.

Each floodplain soil boring will be processed into 1-foot segments with each segment analyzed for a variety of chemical and physical parameters. Further information regarding drilling locations, spacing, target depth, and the final segmentation scheme is provided in the FSP (Louis Berger, 2010b); these parameters will be determined and modified accordingly based on geochemical data analysis of existing soils data and adjusted as appropriate based on field conditions observed during the floodplain soil boring program itself.

Investigation of the large floodplain area proximal to the confluence of Bound Brook and Green Brook will be conducted if the results of low resolution cores, water column samples, and sediment trap samples near this area indicate the potential for transport of contaminated sediments to this area.

Prior USEPA investigations have revealed the presence of buried capacitor debris from the former CDE facility and possibly other sources of unauthorized dumping in the banks and floodplain areas of Bound Brook proximal to the former CDE facility (refer to Section 2.2.3.6 of this Work Plan). USEPA has indicated that additional geophysical or test pit surveys will not be useful to delineate the areal extent of buried waste due to the large amount of debris in the subsurface, including large scrap metal items, and that the entire bank proximal to OU2 is to be considered a capacitor debris area. Floodplain borings will be advanced in this area, if physically possible, to determine the depth extent of underlying soil contamination. Further details on the floodplain soil boring program are provided in Section 8 of the FSP.

5.3.10. Hydrodynamic Data Collection

Hydrodynamic data collection will consist of field geology and stream flow surveys, groundwater elevation monitoring, and continuous flow data collection. The objectives of the hydrodynamic data collection effort are to:

- Characterize the connection between shallow groundwater and surface water.
- Identify groundwater discharge areas to establish water column sampling locations (refer to Section 5.3.12).
- Provide data for hydrodynamic and sediment transport model calibration.

A field geology and stream flow survey will be conducted to evaluate groundwater discharge to Bound Brook. The field geology portion of the survey will visually identify outcrops and fracture zones that indicate the discharge of groundwater to Bound Brook, and the stream flow portion of the survey will identify potential areas of groundwater contribution. Stream flow measurements will be collected during a low-flow period on transects spaced approximately every 0.25 miles. Flow will also be measured/estimated in each tributary and flowing outfall, as possible. During the stream flow survey, water quality data will also be collected at each transect (dissolved oxygen, temperature, conductivity, turbidity, salinity). By summing the flow for each reach and evaluating field parameter measurements, groundwater input and location of the discharge can be estimated. A field geology survey will be conducted concurrent with the stream flow survey to visually identify outcrops and fracture zones that indicate discharge of groundwater to Bound Brook.

Groundwater elevation monitoring is currently an optional task. If conducted, piezometers and staff gauges will be installed adjacent to Bound Brook in areas of likely groundwater discharge for water level monitoring.

Ultrasonic water level sensors and dataloggers will be installed to continuously collect data necessary to evaluate Bound Brook discharge during the RI field effort (approximately one year).

5.3.11. Porewater Sampling

Porewater sampling will be performed if the results of the stream flow survey (Section 5.3.10) indicate the potential for transport of contaminated groundwater into Bound Brook. The sampling design will be presented, as necessary, in an addendum to the planning documents.

5.3.12. Water Column Sampling

Large-volume water column grab samples (25 liters for PCBs and dioxins; standard volumes for other parameters) will be collected from sampling locations established at groundwater discharge areas (if applicable) and other major features (*e.g.*, confluences and contaminant sources). Two rounds of water column sampling will be conducted during base flow conditions. The objectives for the water column sampling program are to better understand the fate and transport of dissolved and particle-associated contaminants in OU4 surface water and to obtain data to support the BHHRA and ERA. Water column samples (whole water, filtered solids, and dissolved phase) will be submitted for laboratory analysis including PCB congeners, dioxins, and TCL/TAL parameters. During grab sample collection, field parameters measured will include pH, temperature, conductivity, dissolved oxygen, turbidity, and oxidation-reduction (redox) potential.

5.3.13. Sediment Trap Sampling

Sediment trap sampling will be conducted to characterize contaminant concentrations on suspended solids under a range of flow. The objective of the sediment trap sampling is to characterize the transport of contaminated sediment within OU4 over a period of 2 to 4 weeks (sediment trap deployment duration), with the intent of integrating storm events and base flow conditions.

Sediment traps gradually accumulate and integrate sediment from the overlying water column during the period of deployment. Upon retrieval, the accumulated sediment is removed from the sediment traps and submitted for laboratory analysis.

Sediment trap data are indicative of water column suspended solids data collected during a storm event (provided that a storm occurs during the period of sediment trap deployment). The use of sediment traps avoids the logistical challenges and cost of mobilizing multiple water column sampling teams during a storm and the need to collect multiple grab samples during the rising and falling limb of the hydrograph (with the potential that the peak sediment transport during the storm event might still not be adequately characterized).

One round of sediment trap sampling will be conducted on each unnamed tributary, and on Cedar Brook. It is also anticipated that sediment trap sampling may be performed at the same (or a subset of) locations as the large-volume water column grab samples. Sediment trap locations will be finalized based on the results of the stream flow survey. The sediment trap samples will effectively characterize the hydrophobic contaminants such as PCBs, dioxins, and inorganics such as lead that are primarily transported as particle-associated contaminants in the water column. Potential further investigation of the unnamed tributaries will be based on evaluation of the results from the sediment trap data for each tributary. Analysis parameters for the sediment trap samples will be prioritized, and the solids collected in the traps analyzed following this hierarchy. The amount of mass obtained during trap deployment will determine how many constituents will be analyzed for - if a low solids mass is collected by the trap only the top parameters will be analyzed, and if a high solids mass is obtained, it may be possible to analyze the full contaminant list.

5.3.14. Habitat Characterization and Reference Site Selection

Much of the habitat within OU4 has been well characterized, with the most comprehensive work conducted during the 1999 Ecological Evaluation (USEPA, 1999). Since then, a wildlife species investigation (Stantec, 2008) within and upstream of OU4 and a habitat assessment (Malcolm Pirnie, 2008) in OU2 have been conducted. Therefore, habitat characterization will be conducted within selected areas of OU4 and one or more potential reference locations outside of OU4 to:

- Document current conditions.
- Document changes in habitats previously characterized.
- Characterize habitat in areas not previously characterized.
- Inform selection of receptors for ecological risk assessment.
- Confirm identification of reference site(s) for collection of soil and sediment control samples for toxicity and bioaccumulation tests and identification of background concentrations.

Areas in which habitat has previously been characterized will be visited, to the extent they are accessible, and current conditions and changes will be documented.

Habitat characterization will be conducted in areas not previously characterized, as appropriate and to the extent they are accessible. This will include characterizing: the dominant vegetation within each habitat, community structure, wildlife utilization, and sensitive resources such as surface waters and wetlands. This information, together with surface water, sediment, and floodplain soil, biota whole body or tissue residue data, and/or toxicity and bioaccumulation tests will be used to assess potential adverse effects resulting from the selected COPECs.

Potential aquatic and terrestrial habitat will first be determined from aerial photographs and mapping (*e.g.*, National Wetland Inventory) prior to going into the field and identified as polygons on field maps/figures. The identified polygons will be investigated in the field, to the extent they are accessible, to determine key habitat features.

Information to be collected on key habitat features for aquatic habitat includes:

- Bank erosion (or the potential for erosion).
- Percent of vegetation overhanging the bank.

- Amount of protection vegetation affords to the bank and the near-stream portion of the riparian zone.

- Water depth and clarity and bottom conditions (*e.g.*, sediment type, hard bottom).

- Presence of submerged aquatic vegetation including species present and relative abundance.

- Relative quantity and variety of natural structures in the brook, as well as its impoundments and tributaries, such as cobble (riffles), large rocks, fallen trees, logs and branches, and undercut banks, available as refugia, feeding sites, or sites for spawning and nursery functions of aquatic macrofauna.

- Percent cover (logs, boulders, cavities, brush, debris, or standing timber) during summer within pools, backwater areas, and littoral areas.

Information to be collected on key habitat features for terrestrial habitat includes:

- Composition of the tree (overstory) layer, scrub/shrub layer, and herbaceous vegetation layer including dominant species in each stratum.

- Cover type (*e.g.*, woodland, grassland).

Fish and wildlife observed during the habitat characterization will be recorded. Number of individuals observed, species utilization of habitat (*i.e.*, foraging, nesting *etc.*), and species utilization of vegetation stratum (*i.e.*, submerged aquatic vegetation, open field, shrub/scrub, forested) will be noted. Available data from the New Jersey Division of Fish and Wildlife Endangered and Nongame Species Program and other federal or local agencies will be used to identify possible habitat for documented threatened or endangered species that may utilize habitat within OU4.

It is expected that at least two reference sites will be required for OU4: an impoundment (as a reference site for New Market Pond) and a water body similar to the Bound Brook channel. Areas within close proximity to, but outside of, OU4 and draining mostly residential and some commercial/industrial areas and wetlands, based on 2002 NJDEP landuse/land cover data (NJDEP, 2002) and NJDEP and NWI wetlands mapping, are preliminarily identified for further investigation as potential reference locations. These areas are shown on Figure 5-3i. Potential reference locations for impoundments within OU4 (New Market Pond) include Cedar Brook Lake on Cedar Brook and/or Lake Nelson on Ambrose Brook. Several areas are identified for investigation of potential reference locations for brook sediment/floodplain soil within OU4. Depicted on Figure 5-3i, these include:

- Area A - Bound Brook and some of its tributaries upstream of OU4.
- Area B - Cedar Brook upstream of OU4 and possibly upstream of Cedar Brook Lake.
- Area C - Green Brook upstream of the optional 100-year floodplain boundary.

Potential reference locations will be investigated during the RI for similar physical and biological characteristics with the water bodies and floodplains within OU4. To determine the most suitable reference location(s), various parameters will be evaluated and considered during the RI investigation. These include physical and biological characteristics such as: stream morphology; water depth, temperature, and pH; sediment particle size distribution, redox characteristics and organic matter content; habitat structure; and relative species abundance, richness, and diversity. Locations of known contaminated sites and verification of land use/land cover will also be considered in selecting reference locations. This information will be used to conduct a comparative assessment of similar habitats present within OU4 and within reference location(s). In addition, samples of surface soil and surface sediment will be collected to provide material for control samples for toxicity and bioaccumulation testing and will also be analyzed to characterize COPC and COEPC concentrations at the reference sites (see Section 5.3.15).

5.3.15. Sediment and Soil Grab Sampling

Additional sediment and soil grab samples will be collected from OU4 to provide volume for toxicity tests required to support the BHHRA and ERA; these activities are described in Section 12 of the FSP (Louis Berger, 2010b).

Sediment toxicity tests, and sediment and floodplain soil bioaccumulation tests, will be conducted to support the ERA. The testing will be conducted at an off-site, subcontract laboratory using sediment and floodplain soil collected from OU4 locations. The objectives of the biological testing program include:

- Assessing the effects of exposure to contaminants in sediment to representative invertebrate species.

- Determining the bioavailability PCBs in sediment and floodplain soil and uptake into representative aquatic and terrestrial invertebrates to support food web modeling and hazard evaluation for higher trophic level organisms identified as ecological receptors of concern.

<u>Sediment Toxicity Tests -</u> In the sediment toxicity tests, test specimens are exposed to both sediments collected from locations in OU4 and control sediments. Both-short term toxicity tests, which measure acute effects (*e.g.,* survival and growth), and long-term toxicity tests, which measure sub-lethal effects (*e.g.,* growth and

reproduction), will be conducted. Toxic effect is determined by comparing the response of test specimens exposed to OU4 sediments to the response of test specimens exposed to control sediment.

The sediment toxicity tests will be conducted following the methodologies presented in the USEPA's Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates (USEPA, 2000). Test acceptability criteria include adequate control survival (which varies for each type of test) and completion of reference toxicant testing. Other test acceptability criteria, as well as appropriate data analysis methods for each type of test and laboratory performance requirements, are specified in the methods.

The following sediment toxicity tests will be conducted:

- 10-Day survival and growth test with the amphipod Hyalella azteca (Test Method 100.1).
- 10-Day survival and growth test with the chironomid Chironomus tentans (Test Method 100.2).
- 42-Day survival, growth, and reproduction test with Hyalella azteca (Test Method 100.4.
- Life-cycle test with Chironomus tentans (Method 100.5).

Sediment samples from the following five locations will be collected for the toxicity tests (and sediment bioaccumulation tests, as described below):

- In Bound Brook, opposite the former CDE facility.

- A location in Bound Brook (to be determined based on the results of the geophysical survey) between the former CDE facility and New Market Pond.

- A location in the deeper part of New Market Pond.

- A location in Bound Brook (to be determined based on the results of the geophysical survey) in Bound Brook downstream of New Market Pond.

- A reference site (exact location to be determined).

Sediment samples will be collected using a Petite Ponar (or similar) grab sampler. Sediment toxicity (and bioaccumulation) tests are typically conducted with samples representing surface sediments (i.e., the top 3-4 inches). It is anticipated that 12 liters of sediment will be collected at each location.

Sediment and Floodplain Soil Bioaccumulation Tests - Sediment bioaccumulation tests with the aquatic oligochaete Lumbriculus variegatus will be conducted following the methodology presented in the USEPA's Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates (USEPA, 2000; Test Method 100.3). Floodplain soil bioaccumulation tests with an appropriate terrestrial earthworm species (to be determined) will be conducted following the methodology presented in ASTM International's Standard Guide for Conducting Laboratory Soil Toxicity or Bioaccumulation Tests with the Lumbricid Earthworm Eisenia fetida and the Enchytraeid Potworm Enchytraeus albidus (ASTM International, 2004; E 1676-04). The chemicals of interest for the bioaccumulation tests are the PCB congeners.

In bioaccumulation tests, test specimens, typically of a single species and as uniform in size and maturity as possible, are exposed to test sediment (or soil) and a control sediment (or soil). A subsample of test specimens is analyzed for the chemical of interest prior to test initiation. At the end of the exposure period, sediment and excess moisture are removed from test specimens, which are weighed, depurated for a 24-hour period, and re-weighed, and then frozen and shipped to an appropriate chemical analytical laboratory for analysis of the chemical of interest.

Bioaccumulation is determined by comparing body burdens of the chemical of interest in test specimens exposed to OU4 sediment (or floodplain soil) to body burdens in control specimens, as well as levels observed in a subsample of pre-test specimens.

Sediment samples for the aquatic invertebrate bioaccumulation tests will be collected at the same locations, and following the same methodology, indicated above for the sediment toxicity tests.

Floodplain soil samples from the following four locations will be collected for the for the terrestrial earthworm bioaccumulation tests:

- The location along the Bound Brook corridor with the highest PCB concentrations based on review of the existing floodplain soil data.
- Two locations along the Bound Brook corridor to be determined based on review of preliminary PCB data for floodplain soil samples collected during the RI.
- A reference site (exact location to be determined).

The samples will be collected using an appropriate method, such as a box corer or similar device. It is anticipated that 24 liters of floodplain soil will be collected at each location.

5.4. SAMPLE ANALYSIS/VALIDATION

The USEPA's FASTAC program will be used for routine analyses. An authorized requestor will request Routine Analytical Services (RAS) sample slots in the CLP via the USEPA Region 2 Regional Sample Control Coordinator (RSCC) office in Edison, New Jersey. The authorized requestor will also request sample slots with the USEPA's Region 2 DESA laboratory in Edison, New Jersey via the RSCC office.

In the event that CLP or DESA cannot accept the samples, a private laboratory will be subcontracted. Typically, only special non-CLP analytical services or fast turnaround time will preclude the use of CLP or DESA. All CLP data will be validated by the USEPA. Subcontracted laboratory analytical services will be validated by Louis Berger data validators or by subcontracted data validation specialists.

5.4.1. Chemical Analysis

Sediment, floodplain soil, and surface water samples collected for PCB Aroclors, PCB Congeners, Dioxins, and TCL/TAL compounds will be analyzed through the USEPA CLP or DESA, provided that required analytical sensitivity can be achieved. A RAS or non-RAS form will be submitted to the USEPA RSCC office at least two weeks prior to any planning sampling events. If CLP is used for any sampling event, Forms II Lite will be used and a Trip Report will be submitted within two weeks of the completion of the sampling event. Analytical Services Tracking System (ANSETS) reports for non-CLP data will also be completed upon sample completion.

Other laboratories will be subcontracted for non-routine analytical services such as acid volatile sulfides/simultaneously extracted metals and bioaccumulation testing. The QAPP provides further discussion of required sample analyses and analytical sensitivity and likely laboratory assignments.

5.4.2. Data Validation

Validation will be accomplished by comparing the contents of the data packages and QA/QC results to the requirements contained in the applicable analytical methods and the laboratory Statements of Work. All TCL/TAL data generated through the CLP will be validated by RSCC using the latest applicable USEPA Region 2 validation procedures. Data generated by DESA are considered USEPA-validated and are useable as reported. No third party data validation will be performed on DESA-generated data.

Non-CLP analytical data will be validated by Louis Berger data validators or a subcontractor in accordance with USEPA's National Functional Guidelines and applicable Region 2 guidelines.

5.4.3. Sample Tracking

Sample tracking consists of the arrangements for and allocation to the designated CLP and non-CLP laboratories. The task includes assuring proper documentation and transportation of the samples to the laboratories and communication with the RSCC office and/or the DESA Laboratory.

Sample tracking will include the following activities:

- Scheduling RAS sample slots in the CLP with the USEPA Region 2 RSCC office in Edison, New Jersey.
- Scheduling sample slots with the USEPA DESA Laboratory in Edison, New Jersey via the RSCC office.
- Interacting with the RSCC, the DESA Laboratory, Sample Management Officer (SMO), field personnel, and others involved in sample collection and analysis.

- Generation of trip reports and use of Forms II Lite, and ensuring receipt of samples by the laboratories.
- Coordinating sample analyses by non-CLP subcontract laboratories.
- Organizing analytical data packages as they are received.

5.5. DATA EVALUATION

Data evaluations envisioned for the RI dataset include, but are not limited to, the following:

- Mapping of sediment physical properties and texture in OU4.
- Evaluations to establish potential relationships between sediment texture and sediment contaminant concentrations.
- Spatial evaluations to establish potential relationships between the location of capacitor debris areas and sediment/soil contaminant concentrations.
- Downcore profiles and geochemical evaluation of radionuclide and chemical parameter data from high resolution sediment cores to discern contaminant depositional history in OU4.
- Geochemical and spatial evaluation of sediment and floodplain chemical data to support RI nature and extent evaluations.
- Data assessment to identify the potential for recontamination of Bound Brook from contaminant sources other than the former CDE facility.

- Geochemical evaluation of sediment transport and OU4 water column contaminant loads using data from surface water sampling and sediment trap deployments.
- Hydrologic evaluation for OU4 watershed and other data evaluations required to calibrate numerical or analytical hydrodynamic and sediment transport models, if needed.
- Food web bioaccumulation modeling and other data evaluations to support the preparation of human health and ecological risk assessments.
- Refining the OU4 CSM.

The RI data will be used to completed these data evaluations. Sample-specific parameters for each medium investigated during the RI are provided in the QAPP. As stated in QAPP Worksheet Nos. 12, 14, 17, and 19, PCB congener analysis will be performed on all high resolution core, surface water, sediment trap, and biota samples and on a percentage of the low resolution core and floodplain soil samples.

An interim data evaluation report will be prepared for each phase of sampling activities or surveys after all validated data are received. The reports will include a written summary, interpretive tables and figures, supporting field sampling logs, and recommendations for adjustments to the design of successive data gathering phases. The interim reports will include summaries of chemical data and other physical observations and field measurements, as well as data evaluations. The Phase I data report will include recommended sampling locations for the high resolution cores. The Phase II data report will include potential adjustments to the analytical parameters and sampling locations for the low resolution cores. Evaluating the data as they are collected will permit early identification of any data gaps and data quality issues that must be resolved prior to completing the RI. The interim data evaluation reports will be submitted to USEPA, USACE, and NJDEP.

5.6. ASSESSMENT OF RISK

A BHHRA and an ERA will be conducted to characterize the potential for adverse health effects associated with exposure of human and ecological receptors to surface water, sediment, floodplain soil, and biota in OU4 that could prevail, currently and in the future, in the absence of remedial action. The risk assessments will be based on combinations of existing data and data obtained during the RI, depending on the environmental medium. In general, preference will be given to more recent data; however, it is anticipated that some older, existing data may be used where more recent data are not available or will not be collected during the RI.

5.6.1. Baseline Human Health Risk Assessment

The BHHRA will be conducted in accordance with USEPA's Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A (USEPA, 1989b), Part D (USEPA, 2001a), Part E (USEPA, 2004), and Part F (USEPA, 2009), and other related guidance.

5.6.1.1. **Overview**

The objective of the BHHRA is to characterize human health risks associated with exposure to chemicals in surface water (*i.e.,* whole water), sediment, floodplain soil, and biota (*i.e.,* fillets of edible fish species), currently and in the foreseeable future, without remedial action. Current and reasonably anticipated future land uses along the Bound Brook corridor will be considered in the assessment. Environmental release mechanisms, exposure pathways, exposure routes, and human populations were preliminarily identified in Section 3.3 and as shown in the CSEM presented in Table 3-11.

The BHHRA will follow the four-step process typically used to assess potential human health risks:

Data Evaluation – selected existing and new analytical data will be compiled and analyzed to determine the usability of the data and to select COPCs that are representative of the contamination detected in OU4. For the COPC selection process, data for channel sediment and bank soil/sediment will be segregated, data in these grouping will be segregated by depth (*i.e.*, 0-6 inches vs. deeper samples), and COPCs will be selected for each data set. For floodplain soil, data will be further segregated by depth (i.e., 0-1 feet or 0-2 feet and 0 to the depth of the deepest sample analyzed) and COPCs will be selected for each data set.

The decision process for the selection of COPCs is as follows:

- All chemicals designated by the USEPA as Class A human carcinogens will be selected as COPCs, regardless of the other selection criteria.

- The essential nutrients (*i.e.*, calcium, magnesium, potassium, and sodium) will be eliminated as COPCs.

- Analytical data will be screened against current RSLs developed by Oak Ridge National Laboratory. RSLs for tap water will be used to screen surface water data, RSLs for residential soil will be used to screen sediment and floodplain soil data, and RSLs for fish will be used to screen edible fish tissue data. In addition, NWQC protective of human health from consumption of organisms only will be used to screen surface water data. Consistent with USEPA Region 2 guidance, the RSLs based on non-cancer health effects will be reduced by one-tenth to represent a target hazard quotient (THQ) of 0.1. Chemicals detected at concentrations less than these criteria will not be selected as COPCs.

- Chemicals that do not have screening levels will be retained as COPCs.

- Per USEPA guidance, for sample sizes greater than or equal to 20, if the detection frequency of a chemical is less than 5 percent and the chemical is not considered to be Site-related, it will be eliminated as a COPC.

Exposure Assessment – exposure assessments will be conducted to identify actual or potential pathways of human exposure, characterize potentially exposed human populations, and where possible, quantify the exposure of potentially affected populations. Actual or potential exposure pathways, identified by a source and mechanism of chemical release, an environmental transport medium, a point of potential contact, and an exposure route, will be evaluated. All potential exposure pathways will be identified and a rationale will be provided for the inclusion or exclusion of each pathway. Based on the current understanding of the OU4, a preliminary CSEM is presented in Table 3-11.

Potential exposure pathways include the environmental media of concern at OU4: surface water, sediment (including bank soil/sediment), floodplain soil, and biota.

Potentially exposed populations will be characterized to determine whether there is potential for casual contact or intake of chemicals. This characterization will include estimates of the ages of people potentially exposed at each exposure point and identification of human activity patterns that may influence exposure. Potential-exposed human receptors, currently and reasonably anticipated in the future, include recreationists utilizing the Bound Brook corridor, workers who may be involved in maintaining spillways and culverts along the Bound Brook corridor, residents and commercial/industrial workers who live or work within or in proximity to the floodplains along the Bound Brook corridor, construction/utility workers who may be involved in subsurface activities within the floodplain soils along the Bound Brook corridor, anglers who fish along the Bound Brook corridor, and anglers/sportsmen who may consume aquatic organisms caught in Bound Brook or associated tributaries.

Depending on the environmental medium of concern, exposure routes could include incidental or intended ingestion, incidental dermal contact, and inhalation of volatile chemicals or chemicals associated with soil/sediment particles released to outdoor air. The results of the informal angler survey will be considered in the development of the exposure scenario involving consumption of edible aquatic organisms.

Based on preliminary evaluation of the existing PCB data for sediment and floodplain soil, it is anticipated that the potential for exposure will be evaluated for a number of exposure units, as listed in Table 5-1. Edible fish tissue data will be combined into two datasets (i.e., Bound Brook and Spring Lake) representing two exposure units. These exposure units may be modified based on further evaluation of the existing data and evaluation of the new data collected during this RI. Preliminary exposure units are shown on Figures 5e through 5h.

It is anticipated that the sediment data will be used as follows to evaluate the current and future potential for exposure and health risk:

- Sediment: COPCs in the 0-6 inch samples will be used to evaluate the current scenarios. The higher of the COPC concentrations in the 0-6 inch samples and the corresponding deep samples will be used to evaluate the future scenarios, to allow for scour and other environmental processes that could expose the deeper COPC concentrations.

It is anticipated that floodplain soil data will be used as follows to evaluate the current and future potential for exposure and health risk:

- Floodplain soils data from the ground surface to 1 or 2 feet below the ground surface, depending on analytical results, will be used to evaluate potential exposure to residents and commercial/industrial workers recreating/working in floodplain soil areas.

- Floodplain soils data from the ground surface to the deepest depth analyzed will be used to evaluate potential exposure of construction/utility workers conducting intrusive activities in floodplain soil areas.

Pending the analysis of the analytical data, estimates of exposure point concentrations (EPCs) for the COPCs in each environmental medium of concern will be determined; the EPCs will be estimated using statistical evaluations to determine the appropriate 95% upper confidence limit (UCL) on the arithmetic average using the current version of the ProUCL software or other comparable software recommended by the USEPA. EPCs in other media (*e.g.*, outdoor air) will be derived from either numerical relationships between the chemical properties and chemicals concentration in the environmental medium or from simplified screening models. Such determinations will involve evaluation of the environmental fate and transport processes operable for each chemical.

COPC concentrations in outdoor air released from floodplain soils by wind or mechanical erosion will be estimated from emission rate or flux calculations developed by the USEPA and screening-level atmospheric dispersion modeling. COPC concentrations of bioaccumulative, toxic, and persistent chemicals in edible fish tissue, other than PCBs, will be estimated from surface water and/or sediment data from available bioaccumulation factors (BAF) and biota-sediment accumulation factors (BSAF).

Estimates of chemical intake and exposure will be developed to portray reasonable maximum exposure (RME) that might be expected occur. Thus, the highest exposure that might reasonably be expected to occur at the Site, one that is well above the average case of exposure but within the range of possibility, will be considered. Per USEPA Region 2 guidance, if risks in excess of USEPA acceptable levels are determined for an exposure pathway, the pathway will be re-evaluated using central tendency exposure (CTE) parameter values, where available, in the place of the upper-bound values used in the RME analysis.

Toxicity Assessment – also termed the dose/response assessment, the toxicity assessment serves to characterize the relationship between the magnitude of exposure and the potential that an adverse effect will occur. It involves determining whether exposure to a chemical can cause an increase in the incidence of a particular adverse health effect, and characterizing the nature and strength of the evidence of causation. The toxicity information is then quantitatively evaluated and the relationship between the dose of the chemical received and the incidence of adverse effects in the exposed population is evaluated.

The USEPA and other regulatory agencies have performed toxicity assessments for numerous chemicals. The guidance they provide will be used in the BHHRA. These include verified reference doses (RfDs) or verified reference concentrations (RfCs) for the evaluation of noncarcinogenic effects from chronic exposure to chemicals and cancer potency slope factors or unit risk factors (URFs) for the evaluation of incremental cancer risk from lifetime exposure to chemicals. For receptors whose exposure is less than chronic (*e.g.*, construction workers assumed to be exposed over a one-year period), subchronic or acute RfDs and RfCs, or similarly derived toxicity values, where available, will be used. Sources of toxicological information and toxicity values, in order of preference consistent with current USEPA guidance include:

- Tier 1: IRIS, which is an on-line USEPA database containing current toxicity values for many chemicals that have gone through a peer review and USEPA consensus review process.

- Tier 2: Provisional Peer Reviewed Toxicity Values developed by the USEPA Office of Research and Development/National Center for Environmental Assessment/ Superfund Health Risk Technical Support Center.

- Tier 3: Additional USEPA and non-USEPA sources of toxicity information, including but not limited to the California Environmental Protection Agency toxicity values, Agency for Toxic Substances and Disease Registry (ATSDR) minimum risk levels, and toxicity values published in the USEPA Health Effects Assessment Summary Tables.

Aroclor data and a limited amount of congener data will be available for the PCBs. PCBs risks will be estimated from total PCB data (*i.e.*, by summing Aroclor data for a given sample or summing the congener data or a given sample). In addition, select congeners will be evaluated for dioxin-like toxicity using the current toxic equivalency scheme. Age-dependent adjustment factors (ADAFs) will be applied, as appropriate, for carcinogenic chemicals known to act through a mutagenic mode of action.

For COPCs without toxicological criteria, a qualitative assessment of their potential health risks will be conducted.

<u>Risk Characterization</u> – information from the exposure assessment and the toxicity assessment will be integrated in the risk characterization to determine the likelihood, nature, and magnitude of adverse human health effects. The risk characterization will include an evaluation of carcinogenic and noncarcinogenic human health risks. Regulatory criteria will form the basis for the evaluation of human health risks associated with chemical exposure at the levels estimated in the exposure

assessment. Human health risks associated with exposure to both individual chemicals and chemical mixtures will be evaluated. A qualitative discussion of the sources and magnitude of uncertainties in conducting a predictive, quantitative assessment will be presented.

5.6.2. Ecological Risk Assessment

The overall goal of ERA is to evaluate whether adverse effects to ecological receptors (*i.e.*, organisms and their respective habitats) are occurring or may occur as a result of exposure to one or more stressors. In 1996, USEPA Region II completed a Screening Level Ecological Risk Assessment at the former Hamilton Industrial Park and concluded that a field investigation to collect additional information was appropriate. In June and August of 1997, USEPA collected surface water, sediment, floodplain soil, and biota samples and used the resulting data in the 1999 Ecological Evaluation (USEPA, 1999a). As described previously, the overall conclusions of the 1999 Ecological Evaluation were:

- The structure and function of the stream ecosystem and stream corridor adjacent to and downstream of the former CDE facility are at risk from chemical contamination.
- The benthic community was found to be at risk from exposure to a variety of VOCs, SVOCs, silver, calcium, copper, vanadium, zinc, and dieldrin.
- Fish within the stream were found to be at risk from exposure to selenium and PCBs.
- Based on evaluation using maximum detected concentrations and no observable adverse effects levels (NOAELs):

- Insectivorous birds utilizing the stream were found to be at risk from exposure to lead, PCBs, and total endrin.
- Omnivorous birds utilizing the stream were found to be at risk from exposure to lead.
- Piscivorous birds utilizing the stream were found to be at risk from exposure to lead, PCBs, total endrin, total chlordane, and total DDT.
- Omnivorous mammals using the stream were found to be at risk from exposure to methoxychlor, arsenic, mercury, PCBs, and selenium.
- Carnivorous mammals were found to be at risk from exposure to PCBs.
- Based on evaluation using mean chemical concentrations and lowest observable adverse effects levels (LOAELs):
- PCBs for omnivorous mammals and piscivorous birds and selenium for omnivorous mammals posed the most significant risks in the food web accumulation models.
- Ecotoxicologically-based remedial goals could not be developed for selenium and PCBs due to lack of correlation between sediment concentrations and hazard quotients from food web accumulation modeling.
- Additionally, no acute risk was found from exposure to selenium or PCBs for any of the representative feeding guilds

During September and October 2008, the USEPA collected fish and invertebrate (Asiatic clam) tissue samples which were analyzed for PCB Aroclors and dioxin-like PCB congeners. These data were used in the 2010 Reassessment (USEPA, 2010). The overall conclusions of the 2010 Reassessment were:

- Substantive ecological risk exists to fish and wildlife with the Bound Brook resulting from exposure to PCBs.
- Measured concentrations in fish tissue exceed critical body burden data for PCBs at all sampling locations except the reference location.
- Based on evaluation using conservative life history parameters (i.e., lowest adult body weight and highest published ingestion rates for food) and maximum concentrations for total PCB Aroclors or 95% upper confidence limit on the arithmetic average (95% UCL) concentrations for dioxin-like PCB congeners and NOAELs and LOAELs, unacceptable risk was found for dietary exposure to dioxin-like PCB congeners and/or total PCB Aroclors for:
- All wildlife receptors (i.e., piscivorous birds and mammals, insectivorous birds, invertivorous mammals, and omnivorous birds and mammals) utilizing Bound Brook adjacent to and just downstream of the former CDE facility.
- Omnivorous birds and mammals utilizing the reference location, when using NOAELs.
- Piscivorous birds utilizing New Market Pond, Spring Lake, and, when using NOAELs, the reference location.
- Piscivorous mammals utilizing New Market Pond, Spring Lake, and the reference location.

- Additionally, acute risks were found for piscivorous mammals utilizing Bound Brook adjacent to and just downstream of the former CDE facility, New Market Pond, and Spring Lake.

Therefore, this ERA will serve to update and refine the 1999 Ecological Evaluation and 2010 Reassessment. Where appropriate, existing quantitative data on chemical concentrations, tissue filet data, population size, density, dominance, and diversity will be utilized. Background ecological data for OU4 will be obtained from federal and state agencies, as well as from field observations and data collection in reference locations.

5.6.2.1. **Overview**

The ERA will follow USEPA's Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (USEPA, 1997), USEPA' s Guidelines for Ecological Risk Assessment (USEPA, 1998b), the U.S. Army Corps of Engineers' Risk Assessment Handbook Volume II: Environmental Evaluation (USACE, 1996), and other pertinent guidance documents.

The objectives of the ERA are to:

- Identify and characterize existing ecological resources/habitats and resource values (quality/quantity of the resources) within OU4.

- Identify biological receptors that may utilize affected habitats within OU4.

- Evaluate the potential acute, chronic or bioaccumulation effects resulting from exposure to contamination related to the former CDE facility within OU4, currently and in the future in absence of remedial action.

- Provide a basis to evaluate the ecological suitability/impacts of selected remedial alternatives with respect to both short-term and long-term successes.

The steps to be completed in the ERA include problem formulation, exposure and effects evaluation, exposure estimation, risk characterization, and uncertainty analysis. Each of these steps is described further in the following sections.

5.6.2.2. **Problem Formulation**

The problem formulation from the 1999 Ecological Evaluation will be revisited and revised to include data collected since it was conducted and collected during the RI. Existing conditions will be documented based on all information gathered. This will include:

Site Description - data obtained from federal, state and local agencies will be utilized in conjunction with field observations to document and assess existing ecological conditions. Specific data include vegetation cover type, fish and wildlife assemblages, significant habitats and wildlife concentration areas, endangered/threatened species, surface waters and wetlands. Available mapping will be analyzed for the purpose of identifying unique physical characteristics and features, as well as potential pathways of exposure. Sources of such information will include USGS quad maps, NWI and NJDEP wetland mapping, aerial photography, and GIS information (*e.g.*, land use/land cover).

Resource Characterization - the quality of existing habitats within OU4 and potential reference location(s) will be evaluated based upon field observations made during the habitat characterization and information from state and local agencies and local academia. Determination of suitable reference locations is discussed further in Section 5.3.14, Habitat Characterization.

Data Evaluation and Selection of COPECs - All chemical data collected during the RI and pertinent historical data will be evaluated and used to select COPECs. Appropriate ESVs will be identified for comparison to environmental quality data in selecting COPECs. ESVs from the preliminary risk assessment presented in Section 3.3 will be considered for use in selecting COPECs. Chemical fate and transport, ecotoxicity, and bioaccumulative potential will also be considered in selecting COPECs.

Conceptual Site Exposure Model – The preliminary ecological conceptual site exposure model presented in Section 3.3.4 and Figure 3-16 will be revised, as necessary, to incorporate information gathered during the RI.

Selection of Assessment and Measurement Endpoints – Preliminary selection of assessment and measurement endpoints is discussed below. These endpoints will be re-evaluated for applicability and ecological relevance based on information gathered during the RI.

5.6.2.3. **Preliminary Identification of Assessment Endpoints**

Assessment endpoints are the explicit expression of environmental value that is to be protected. The following list of preliminary assessment endpoints may be modified as the RI progresses in order to meet the objectives of the ERA.

Ecosystem-Based Assessment Endpoint:

Protection of the overall structure and function of Bound Brook and the Bound Brook corridor, including floodplains and wetlands.

Community- and Population-Based Assessment Endpoints:

1. Protection and maintenance of survival, growth, and reproduction of the benthic invertebrate community in Bound Brook.

2. Protection and maintenance of the survival, growth, and reproduction of fish in Bound Brook.

3. Protection and maintenance of the survival, growth, and reproduction of semi-aquatic bird and mammal populations that inhabit/utilize Bound Brook.

4. Protection and maintenance of the survival, growth, and reproduction of terrestrial bird and mammal populations that inhabit/utilize the Bound Brook corridor.

5.6.2.4. **Preliminary Identification of Measurement Endpoints**

Measurement endpoints are measurable characteristics that are related to the environmental value identified in the assessment endpoint. Measured chemical concentrations in surface water sediment, and floodplain soil will be used as measurement endpoints in conjunction with comparison to measures of toxicity. Measured chemical concentrations in these media, as well as in biota, will be used as measurement endpoints when compared with measures of toxicity, as well as to provide the basis of food web accumulation models for representative species. The following preliminary measurement endpoints were identified.

Ecosytem-Based Measurement Endpoint:

Measured chemical concentrations in surface water (total and/or dissolved phase) will be compared to ESVs for surface water protective of aquatic life; however, evaluation of the overall structure and function of Bound Brook and the Bound Brook corridor will also be made through evaluation of the community-based and population-based assessment endpoints.

Community- and Population-Based Measurement Endpoints:

1. To evaluate assessment endpoint #1:

   a. Sediment toxicity testing will be conducted, as discussed in Section 3.4.

   b. Bioaccumulation testing with an infaunal species will be conducted, as discussed in Section 3.4. Whole body residue data for benthic invertebrates will be compared to critical body residue values from the literature.

   c. Measured chemical concentrations in sediment will be compared to ESVs protective of benthic organisms.

2. To evaluate assessment endpoint #2:

   a. Fish whole-body residue data will be compared to critical body residue values from the literature.

3. To evaluate assessment endpoint #3:

   a. Food web accumulation modeling will be conducted for representative omnivorous and piscivorous birds and mammals. Modeled daily doses of COPECs for representative species will be compared to avian and mammalian toxicity reference values (TRVs; *i.e.,* chronic NOAELs and LOAELs) for survival, reproduction, or growth effects.

   b. Measured chemical concentrations in surface water, sediment, and biota (invertebrates and fish) will be used as input to the modeling.

4. To evaluate assessment endpoint #4:

   a. Food web accumulation modeling will be conducted for representative insectivorous, omnivorous, and carnivorous birds and mammals. Modeled daily doses of COPECs for representative species will be compared to avian and mammalian TRVs (*i.e.,* chronic NOAELs and LOAELs) for survival, reproduction, or growth effects).

   b. Measured chemical concentrations in surface water, floodplain soil, and biota (*e.g.*, terrestrial invertebrates) will be used as input to the modeling.

5.6.2.5. **Effects and Exposure Evaluation**

Community-level (*e.g.*, benthic invertebrate community) effects and exposure will be evaluated by comparison of results from sediment toxicity tests from locations within OU4 to those collected in reference locations outside of OU4. Comparison of COPEC concentrations in media of concern to appropriate ESVs will also be used to evaluate exposure and effects to benthic invertebrates. Population-level effects and exposure will be evaluated using food web accumulation modeling for individuals of representative species.

Appropriate toxicity reference values (TRVs) will be selected for each COPEC. Wildlife TRVs are initially selected for many of the preliminary COPECs identified previously in Section 3.3, as shown in Table 5-2, and as discussed below. With the exception of PCBs, the USEPA Eco-SSLs and Sample et al. (1996) are the sources of wildlife TRVs in Table 5-2; however, a search of the literature will be conducted for key COPECs to determine the most current and appropriate TRVs for use in the ERA.

VOCs

None of the VOCs selected as COPECs are considered bioaccumulative. TRVs are not selected for the VOCs at this time since they readily volatilize and are subject to rapid dispersion and degradation in the environment.

SVOCs

TRVs for bis(2-ethylhexyl)phthalate are not selected at this time since it is:

- selected as a COPEC in surface water only.
- a common laboratory cross-contaminant.
- not very soluble in water.

- required to be present at concentrations above the solubility limit to produce acute toxicity.
- not bioaccumulative.

TRVs are initially selected for the remaining SVOC COPECs only if they are considered bioaccumulative. These include the PAHs and dibenzofuran.

Pesticides and PCBs

TRVs are initially selected for all of the pesticide COPECs and PCBs since they are bioaccumulative.

Inorganics

TRVs are initially selected for all the inorganic COPECs.

5.6.2.6. Exposure Estimation

Exposure parameters such as area use factors, dietary composition, and ingestion rates will be identified in order to estimate the exposure to each representative bird and mammal receptor species identified for the food web accumulation modeling. Exposure parameters will be, to the extent practicable, those most relevant to local populations. The USEPA's Wildlife Exposure Factors Handbook (USEPA, 1993) will be used as the basis of default exposure parameters where values from the literature cannot be found.

A wildlife species investigation (Stantec, 2008) indicated that evidence of several avian and mammalian species was observed in OU4 and at the boundary of Bound Brook with Dismal Swamp.

The following bird and mammal species were directly observed within OU4 or evidence of their presence was found within OU4:

Birds

- Canada goose (*Branta canadensis*)
- Mallard (*Anas platyrhynchos*)
- Belted kingfisher (*Ceryle alcyon*)
- Red-tailed hawk (*Buteo jamaicensis*)
- Blue jay (*Cyanocitta cristata*)
- American robin (*Turdus migratorius*)
- American crow (*Corvus brachyrhynchos*)
- Fish crow (*Corvus ossifragus*)
- European starling (*Sturnus vulgaris*)
- Orchard oriole (*Icterus spurius*)
- Baltimore oriole (*Icterus galbula*)
- Mourning dove (*Zenaida macroura*)
- Song sparrow (Melospiza *melodia*)

Mammals

- Eastern chipmunk (*Tamias striatus*)
- Gray squirrel (*Sciurus carolinensis*)
- White-footed mouse (*Peromyscus leucopus*)
- House mouse (*Mus musculus*)
- Muskrat (*Ondatra zibethicus*)
- Raccoon (*Procyon lotor*)
- Striped skunk (*Mephitis mephitis*)
- White-tailed deer (*Odocoileus virginian*us)
- Fisher (*Martes pennant*)

The fisher was the most notable mammal species for which tracks were observed within OU4. This observation occurred just upstream of the former CDE facility. Habitat suitable for short-tailed shrew was observed near the confluence of Bound Brook and Cedar Brook. Suitable habitat for the red fox was observed upstream of the former CDE facility. Mink tracks were found upstream of OU4 along the shore of Bound Brook at the edge of Dismal Swamp. Since mink can range over several miles along a stream or river, it is possible that mink may occur within OU4.

Based on the results of the wildlife species investigation (Stantec, 2008) and the 1999 Ecological Evaluation (USEPA, 1999) the following species are preliminarily identified as representative of the feeding guilds listed in the measurement endpoints.

Semi-aquatic avian and mammalian species

- Mallard – omnivorous bird
- Belted kingfisher – piscivorous bird
- Raccoon– omnivorous mammal
- Mink – piscivorous mammal

Terrestrial avian and mammalian species

- Short-tailed shrew – insectivorous mammal
- American robin – omnivorous bird
- Red-tailed hawk – carnivorous bird
- Red fox – carnivorous mammal

The results of the sediment toxicity tests, discussed in Section 3.4, will be used to qualitatively evaluate exposure and effects to benthic invertebrates within OU4 as compared to the reference location(s).

Whole body residue data for benthic and terrestrial invertebrates from the sediment and floodplain soil bioaccumulation testing for PCBs, as discussed in Section 3.4, will be used as input to the food web accumulation modeling. Uptake factors for other COPECs will be obtained from the literature. COPEC concentrations in biota from the 1999 Ecological Evaluation and the 2010 Reassessment will also be used as input to the food web accumulation modeling.

5.6.2.7. **Risk Characterization**

For each measurement endpoint, one or more lines of evidence may be used to characterize the potential for adverse effects in ecological receptors associated with contamination within OU4. The first line of evidence for the community-level assessment and population-level assessment (*i.e.*, food web modeling) will utilize the hazard quotient (HQ) method (USEPA, 1997). The HQ method characterizes possible ecological hazard as the ratio of concentration in the environmental medium to the corresponding ESV or TRV. The HQ method provides a semi-quantitative means of evaluating the potential for adverse effects from exposure to COPEC. Low HQs are not anticipated to pose significant adverse effects. Other lines of evidence will include the results of the bioaccumulation studies and sediment toxicity testing. Since the HQ method is designed to be conservative and will likely overestimate the potential for adverse effects, a qualitative assessment of the ecosystem within OU4 with respect to the reference location(s) will also be made. Ecotoxicity profiles for key COPECs will accompany the ecological risk characterization to provide further context.

5.6.2.8. **Uncertainty Analysis**

Uncertainty is inherent in the risk assessment process. Sources of uncertainty will be discussed and may be evaluated qualitatively and/or quantitatively. Potential impacts on estimates of risk will be identified.

Future ecological risk may also be assessed based on exposure to deeper sediments accounting for potential scour and other environmental processes exposing deeper sediments.

5.6.3. REPORTING

The BHHRA and ERA will be conducted in two parts: a PAR and the Baseline Risk Assessment report, as follows.

Pathways Analysis Report - the PAR will be completed and submitted, separate from the Baseline Risk Assessment Report, following receipt of the validated analytical data from the RI. The PAR will include Risk Assessment Guidance for Superfund (RAGS) Part D Tables 1 through 6 for the BHHRA and the problem formulation and identification of exposure parameters, assumptions, and TRVs to be used in the effects and exposure evaluation for the ERA. The PAR will serve primarily as a predecessor to the Baseline Risk Assessment Report; comments will be received and addressed, but the PAR will not be revised upon review by the USACE, USEPA, and the Region II BTAG. Comments requiring resolution will be discussed via a teleconference with the USACE, USEPA, and Region II Biological Technical Assistance Group (BTAG), as necessary; responses to comments (RTCs) will be prepared for only unresolved comments. Resolved comments will be incorporated directly into the Baseline Risk Assessment Report. The PAR will include selected draft, report-ready text, figures, and appendices to facilitate the completion of the Baseline Risk Assessment Report.

Interim deliverables (*e.g.*, RAGS Part D Tables 1 and 4, ecological TRVs) may be provided to the USEPA human health risk assessor or Region II BTAG through the USEPA Remedial Project Manager (RPM), for concurrence prior to submitting the PAR.

Baseline Risk Assessment Report - the Baseline Risk Assessment Report will be comprised of the quantitative assessment of the potential for risks to human health and the environment conducted in conformance with the PAR. The BHHRA section will include RAGS Part D Tables 7 through 10, as well as all components of the PAR (*i.e.*, RAGS Part D Tables 1 through 6 and associated text, figures, and appendices).

The ERA section will include the problem formulation from the PAR, revised as necessary, and the effects and exposure evaluation, risk characterization, and uncertainty analysis.

Draft, Draft Final, and Final versions of the Baseline Risk Assessment Report will be prepared.

5.7. TREATABILITY STUDIES/PILOT TESTING

At this time, the need for treatability studies or pilot tests cannot be assessed. Depending on the alternatives to be evaluated in the FS, a treatability study may be needed to prove or compare the site-specific effectiveness of particular technologies. Any treatability studies will be conducted only at the direction of USACE and USEPA.

5.8. REMEDIAL INVESTIGATION (RI) REPORT

A Draft RI Report will be prepared in accordance with the latest RI/FS guidance document (USEPA, 1988a). The report will include a summary of data collected as part of this RI. When the Draft RI Report is completed, it will be submitted to USACE and USEPA for review and comment. Following receipt of all comments, a response to comments (RTC) matrix will be prepared and the comments incorporated into a Draft Final RI Report; a teleconference will be held upon review of the RTC matrix and the Draft Final RI Report. This same process will be followed for the preparation of the Final RI Report, except a teleconference will not be conducted.

5.9. DEVELOPMENT AND SCREENING OF REMEDIAL ALTERNATIVES

This task represents the first phase of the FS. Its purpose is to develop and select an appropriate range of remedial alternatives to be analyzed more fully in the second phase of the FS, the detailed analysis. The requirements of §300.430(e) of the NCP and pages 4-3 through 4-28 of the RI/FS guidance document (USEPA, 1988a) will be adhered to for the development and screening of the remedial action alternatives. Since the development of alternatives is fully integrated with characterization activities, the following activities will proceed under this task:

- Review of the preliminary remedial action objectives identified in Section 3.5.1.

- Review of the preliminary general response actions identified in Section 3.5.2.

- Determination of whether modifications (*e.g.*, refinements, additions, changes) to the preliminary remedial action objectives and preliminary general response actions are necessary to conform to the RI data.

- Identification of the volumes or media to which the identified general response actions might be applied (taking into account the requirements for protectiveness).

- Identification and screening of the remedial technologies and process options applicable to each general response action (evaluation of the universe of potentially applicable technology types and process options with respect to technical implementability in order to eliminate options that cannot be effectively implemented).

- Evaluation of process options using the criteria of effectiveness, implementability, and cost in order to select a representative process for each technology type retained for consideration (technology processes considered implementable are evaluated in greater detail before selecting one process to represent each technology type; one process is selected, if possible, for each technology type, to simplify the development and evaluation of alternatives without limiting flexibility during remedial design).

- Assembling the selected representative technologies into alternatives representing a range of treatment and chemical combinations, as appropriate (general response actions will be combined using different technology types and different media and/or areas of OU4).

For certain categories of response actions, various ranges of alternatives must be included (the no action alternative will be included in every response action category). Actions to control source material will include a range of alternatives in which the principal elements are removal or treatment that reduces the toxicity, mobility, or volume of the hazardous substance, or as appropriate, this range shall include an alternative that removes or destroys hazardous substances to the maximum extent feasible, eliminating or minimizing, to the degree possible, the need for long-term management. Other alternatives will be developed that remove or treat the principal threats but vary in the degree, quantities, and characteristics of removal or treatment residuals and untreated waste that must be managed. One or more alternatives will be developed that provide little or no removal or treatment but provide protection of human and ecological health by preventing or controlling exposure to hazardous substances through engineering controls.

In addition, and to the extent sufficient information is available, the short- and long-term aspects of the following three criteria will be used to screen the defined remedial alternatives:

- Effectiveness – the degree that an alternative reduces toxicity, mobility, or volume through treatment, minimizes residual risks, affords long term protection, complies with potential ARARs, and minimizes short term impacts and time to achieve protection.

- Implementability – the technical feasibility and availability of the technologies comprising each alternative.

- Cost – the costs of construction and any long term costs to operate and maintain the alternatives.

Information available at the time of screening will be used primarily to identify and distinguish differences among the various alternatives and to evaluate each alternative with respect to its effectiveness, implementability, and cost. Alternatives with the most favorable composite evaluation of all factors will be retained for further consideration during the detailed analysis. However, alternatives selected for detailed analysis will, where practicable, preserve the range of treatment and containment technologies initially developed.

Innovative technologies are those that are fully developed, but lack sufficient cost or performance data. If innovative technologies are defined and are determined to offer the potential for comparable or superior performance or implementability, fewer or lesser adverse impacts than other available approaches, or lower costs for similar levels of performance than demonstrated treatment technologies, such innovative technologies will be carried through the screening phase.

5.10. DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

This task represents the second phase of the FS. Its purpose is to evaluate the alternatives carried through the screening phase of the FS in order to provide the basis for identifying a preferred alternative for remedial action. The detailed analysis will consist of the following components:

- Identification and further definition of the alternatives selected from the screening phase (including details on volumes or media to be addressed, the technologies to be used, and any performance requirements associated with the technologies).

- An assessment and a summary profile of each alternative against the evaluation criteria.

- A comparative analysis among the alternatives to assess the relative performance of each alternative with respect to each evaluation criterion.

The performance of this task will be conducted in conformance with the methodology identified in the RI/FS guidance document (USEPA, 1988a) and other conditions specified under §300.430(e) of the NCP.

5.11. FEASIBILITY STUDY (FS) REPORT

A Draft FS Report will be prepared in accordance with Section 6 of the RI/FS guidance document (USEPA, 1988a) and will include remedial action objectives, general response actions, potential ARARs, identification and screening of technologies, and a detailed analysis of remedial alternatives. When the Draft FS Report is completed, it will be submitted to the USACE and USEPA for review and comment. Following receipt of all comments, a RTC matrix will be prepared and the comments incorporated into a Draft Final FS Report; a teleconference will be held upon review of the RTC matrix and the Draft Final FS Report. This same process will be followed for the preparation of the Final FS Report, except a teleconference will not be conducted.

5.12. POST RI/FS SUPPORT

This task includes efforts for any support to the USACE or the USEPA following submittal of the Final RI/FS Reports. This support may include technical assistance (*e.g.*, development of exhibits or slides, technical interpretations, discussions, presentations to management, *etc.*) during the USEPA's development of the Proposed Plan or the ROD.

6. PROJECT SCHEDULE

The proposed schedule for the Cornell-Dubilier Electronics Superfund Site OU4 Bound Brook RI/FS will be provided under separate cover to the USACE and the USEPA after written authorization to proceed with the field investigation is received.

7. PROJECT MANAGEMENT APPROACH

7.1. ORGANIZATION AND APPROACH

For OU4, PM is a shared role due to Louis Berger's involvement in three other OUs at the Site. An Administrative PM has been identified and will be responsible for all administrative aspects of the project including tracking performance and adherence to the established budget and schedule. A Technical PM has also been identified and will be responsible for the technical aspects of the project from initial planning through completion of the RI/FS report. The Technical PM has primary responsibility for planning, developing and implementing the RI/FS, including coordination among RI and FS task leaders and support staff, acquisition of engineering or specialized technical support, and other aspects of the day-to-day activities associated with the project. The Technical PM identifies staff requirements, directs and monitors site progress, and assures implementation of quality control (QC) procedures. A project organization chart along functional lines for this RI/FS is presented on Figure 7-1.

The project team members are selected for their qualifications and experience with the technical issues to be addressed at the Site. If unanticipated problems or project needs are encountered that cannot be adequately handled by this team, technical experts from other offices will be used as necessary with the USACE's and USEPA's concurrence.

The Project Quality Control Officer is responsible for ensuring that appropriate QC procedures are implemented, including acquisition of field equipment and supplies, development of the QAPP, reviews of specific tasks, QC procedures, and field sample management. A QA audit will be performed by the Project Quality Control Officer.

The Project Quality Consultants are responsible for performing independent reviews of project quality. Project Quality Consultants will perform technical reviews of project documents (*e.g.,* planning documents and data interpretation memoranda) throughout all project phases and provide technical guidance which will guide project direction and key conclusions drawn from the collected data.

Project Safety Officer is responsible for monitoring daily compliance of investigation work with the SSHP, recommending changes or additions to the SSHP as required, and providing technical assistance to the Administrative and Technical PMs on problems related to worksite safety.

7.2. COORDINATION WITH THE USACE, USEPA, AND NJDEP

The PM is responsible for coordinating the project with the USACE PM and the USEPA RPM. Weekly telephone contact will be maintained to provide updates on project status. All consultation with the NJDEP will be coordinated through the USACE and the USEPA, although direct contact between the PM and the NJDEP may be maintained, if required and approved by USACE and USEPA. A log of any direct communication with the NJDEP will be maintained and shared with USACE and USEPA as requested.

7.3. SCHEDULE CONTROL

As the project proceeds, the PM will monitor actual progress against the schedule outlined in the Work Plan, and deliverable due dates on a bi-weekly basis and update them, as necessary. The RI/FS tasks described in Section 5 of this Work Plan (when scheduled) will be tracked separately during the RI/FS work. The PM will inform the USACE PM and USEPA RPM of any known or anticipated change of project elements. If a delay occurs or is anticipated, the PM will develop and outline available methods to maintain the overall project schedule. Progress meetings will be held, as needed, to evaluate project status, discuss current items of interest, and review major deliverables such as the RI and FS reports.

7.4. QUALITY ASSURANCE

Work on this assignment will be conducted in accordance with the procedures defined in the site-specific QAPP and FSP (Louis Berger, 2010b). These documents will be prepared and submitted for review and approval concurrent with the Work Plan. Field blanks, field replicates, trip blanks, and samples for laboratory spiking and duplicates will be submitted to the laboratory as outlined in the FSP and QAPP (Louis Berger, 2010b). The desired precision and accuracy of laboratory and field data will be documented in the FSP and QAPP (Louis Berger, 2010b). Laboratory data will be validated in accordance with the USEPA Region 2 validation guidelines.

Deliverables will be reviewed by members of the project team and will include the Project Quality Consultants. The PM will coordinate these reviews and will promote frequent progress reviews during the project. The comments of the review team will be incorporated into the deliverables before review drafts are submitted to the USACE and the USEPA. Louis Berger internal quality control will be performed in accordance with the QCP developed for OU4, which has been submitted under separate cover.

7.5. COORDINATION WITH OTHER AGENCIES

RI activities will require coordination among numerous federal, state, and local agencies, as well as coordination with involved private organizations. Coordination activities with these agencies are as described below.

7.5.1. Federal Agencies

The USEPA is responsible for overall direction and approval of all activities for the Site. Sources of technical information may include, but are not limited to, the USEPA, the USACE, the Agency for Toxic Substances and Disease Registry (ATSDR) the

USGS, USEPA Laboratories/Edison, and U.S. Department of Interior. These sources will be accessed through the USACE PM and the USEPA RPM for background information on the Site.

7.5.2. State Agencies

The state, through the NJDEP, may provide review, direction, and input for the RI/FS. The USEPA RPM will coordinate contacts with the NJDEP.

7.5.3. Local Agencies

Local agencies that may be involved include Middlesex County, and municipal departments for the Boroughs of Plainfield and Middlesex and the Towns of Edison and Piscataway such as planning boards, police, and fire department. Contacts with local agencies will be coordinated through the USEPA RPM.

The Bound Brook headwater is located in Edison Township, New Jersey and flows westerly through South Plainfield Borough into Piscataway Township, where the water is dammed to form New Market Pond. The brook then flows through Middlesex Borough to the confluence with Green Brook.,

7.5.4. Private Organizations

Private organizations requiring coordination during the RI/FS may include Potentially Responsible Parties (PRPs), concerned residents in the area, and public interest groups such as environmental organizations and the press. Communication with these interested parties will be coordinated through the USEPA RPM only; The Louis Berger Group will neither pursue nor entertain project-specific contact with these private organizations unless expressly directed or permitted to do so by the USACE and USEPA.

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9. GLOSSARY OF ABBREVIATIONS

ADAF	Age-dependent Adjustment Factor
ANSETS	Analytical Services Tracking System
AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
ASTM	ASTM International, Inc.
ATSDR	Agency for Toxic Substance and Disease Registry
AWQC	Ambient Water Quality Criteria
BAF	Bioaccumulation Factor
bgs	Below Ground Surface
BHHRA	Baseline Human Health Risk Assessment
BNA	Base-neutral-acid extractables
BSAF	Biota-Sediment Accumulation Factor
BTAG	Biological Technical Assistance Group
CD	Compact Disc
CDA	Capacitor Disposal Area
CDE	Cornell-Dubilier Electronics
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulation
CLP	Contract Laboratory Program
COPCs	Chemicals of Potential Concern
COPECs	Chemicals of Potential Ecological Concern
CSEM	Conceptual Site Exposure Model
CTE	Central Tendency Exposure
CWP	Cultural Resources Work Plan
DDD	Dichlorodiphenyldichloroethane

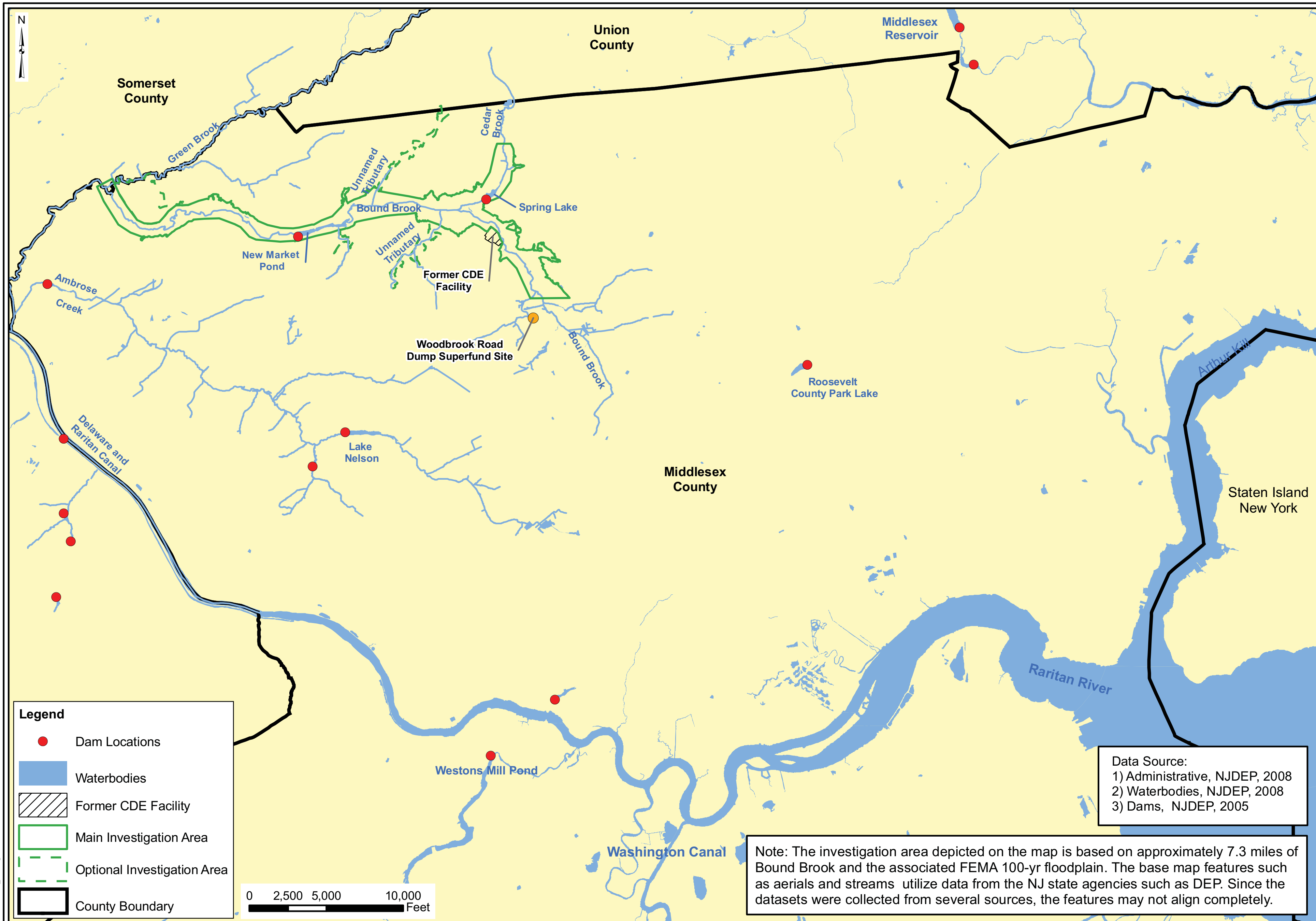
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DESA	U.S. Environmental Protection Agency, Division of Environmental Science and Assessment
DQO	Data Quality Objectives
DSC	D.S.C. of Newark Enterprises Inc.
EMSA	Environmental Measurement and Site Assessment (NJDEP)
EPCs	Exposure Point Concentrations
ERA	Ecological Risk Assessment
ESV	Ecological Screening Value
FASTAC	Field and Analytical Services Teaming Advisory Committee
FEMA	Federal Emergency Management Agency
FS	Feasibility Study
FSP	Field Sampling Plan
ft	foot or feet
FWENC	Foster Wheeler Environmental Corporation
GIS	Geographic Information System
gpd/ft	gallons per day per foot
GWQC	Groundwater Quality Criteria
HQ	Hazard Quotient
HSWA	Hazardous and Solid Waste Amendments of 1984
IDW	Investigation-Derived Waste
IGWSCC	Impact to Groundwater Soil Cleanup Criteria
IRIS	Integrated Risk Information System
LEL	Lowest Effects Level
LOAEL	Lowest Observable Adverse Effects Level
LTTD	Low Temperature Thermal Desorption
MCLs	Maximum Contaminant Levels
mg/kg	milligrams per kilogram
MNR	Monitored Natural Recovery

NAAQS	National Ambient Air Quality Standards
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NJAC	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJSA	New Jersey Statutory Authority
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRQWC	National Recommended Water Quality Criteria
NSPS	New Source Performance Standard
NWI	National Wetlands Inventory
FW2NT	Freshwater, Non-Tidal
ORNL	Oak Ridge National Laboratory
OSWER	Office of Solid Waste and Emergency Response
OU1	Operable Unit 1
OU2	Operable Unit 2
OU3	Operable Unit 3
OU4	Operable Unit 4
PAH	Polycyclic Aromatic Hydrocarbon
PAR	Pathways Analysis Report
PBT	Persistent, Bioaccumulative and Toxic
PCB	Polychlorinated Biphenyls
PM	Project Manager
PRP	Potentially Responsible Party
QA/QC	Quality Assurance / Quality Control
QAPP	Quality Assurance Project Plan
QC	Quality Control
QCP	Quality Control Plan

RAGS	Risk Assessment Guidance for Superfund
RAS	Routine Analytical Services
RCRA	Resource and Conservation and Recovery Act
RfC	Reference Concentrations
RfD	Reference Doses
RI	Remedial Investigation
RI/FS	Remedial Investigation / Feasibility Study
RM	River Mile
RME	Reasonable Maximum Exposure
RPM	Remedial Project Manager
ROD	Record of Decision
RSCC	Regional Sample Control Center
RSL	Regional Screening Level
RTC	Response to Comments
SARA	Superfund Amendments and Reauthorization Act
Site	Cornell-Dubilier Electronics Superfund Site
SOP	Standard Operating Procedure
SRS	Soil Remediation Standards
SSHP	Site-Specific Safety and Health Plan
SSS	Side Scan Sonar
SWQC	Surface Water Quality Criteria
SVOC	Semi Volatile Organic Compound
TAL	Target Analyte List
TBCs	To Be Considered Criteria
TCL	Target Compound List
THQ	Target Hazard Quotient
TOC	Total Organic Carbon
TRC	TRC Companies, Inc.
TRV	Toxicity Reference Value

TSCA	Toxic Substances Control Act
UCL	Upper Confidence Limit
UFP-QAPP	Uniform Federal Policy for Quality Assurance Policy Plans
µg/Kg	Microgram / Kilogram
URF	Unit Risk Factor
USACE	U.S. Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
VOC	Volatile Organic Compound
WQSW	Water Quality Standards for Wetlands

Figures



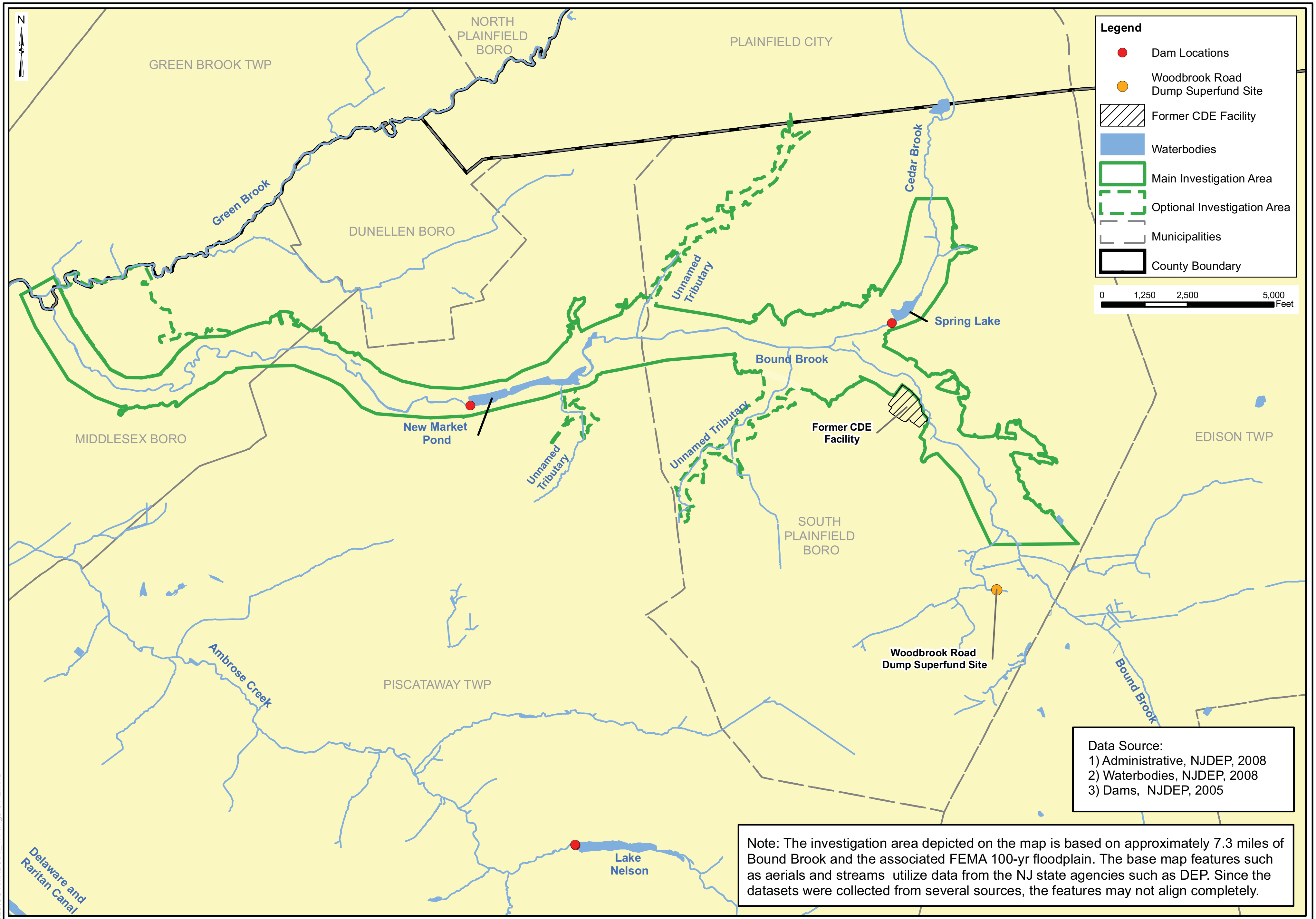
MALCOLM PIRNIE

Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

OU4 Regional Location Map
OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 1-1



MALCOLM PIRNIE

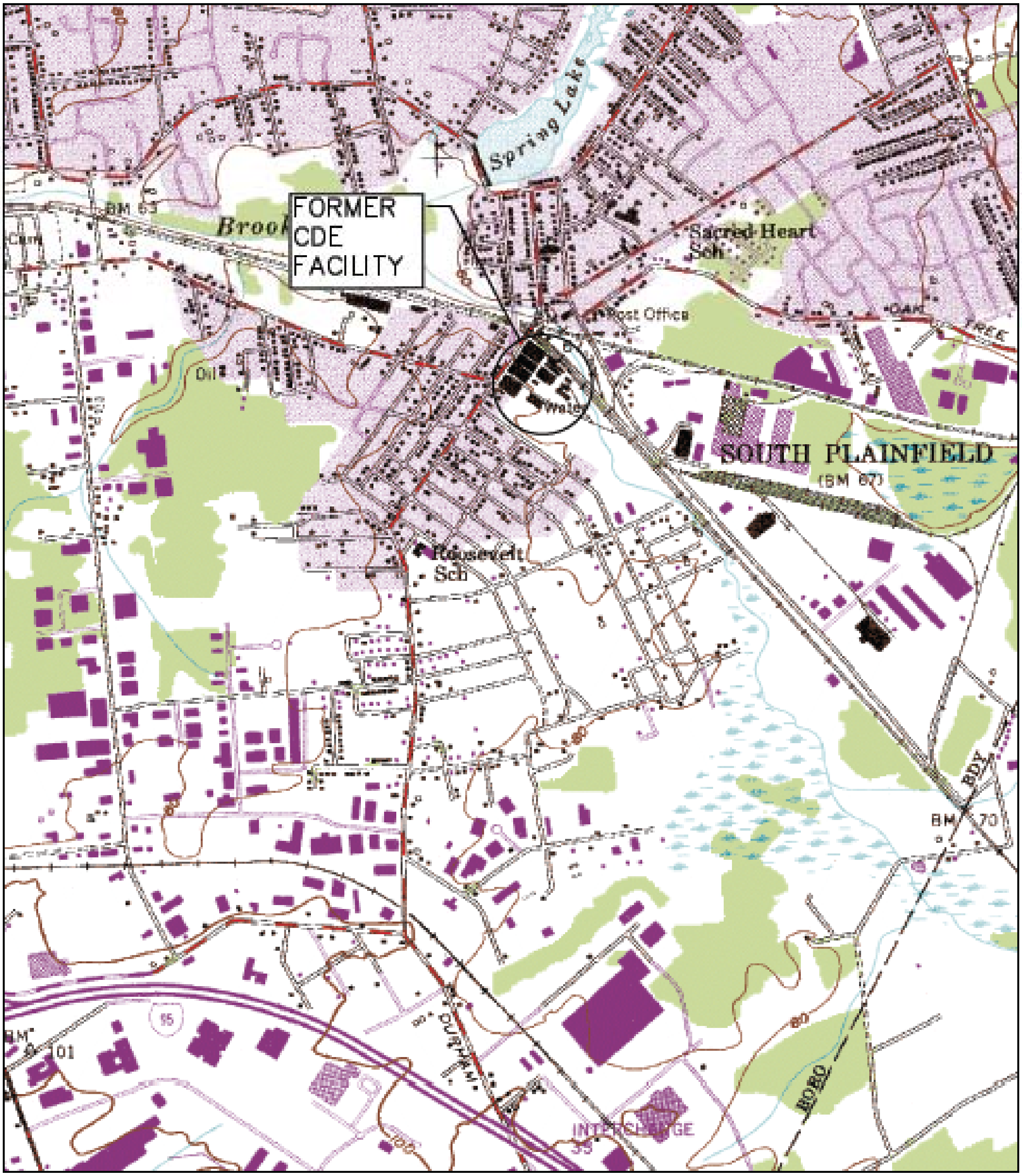
Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

OU4 Investigation Area

OU4 Remedial Investigation/Feasibility Study

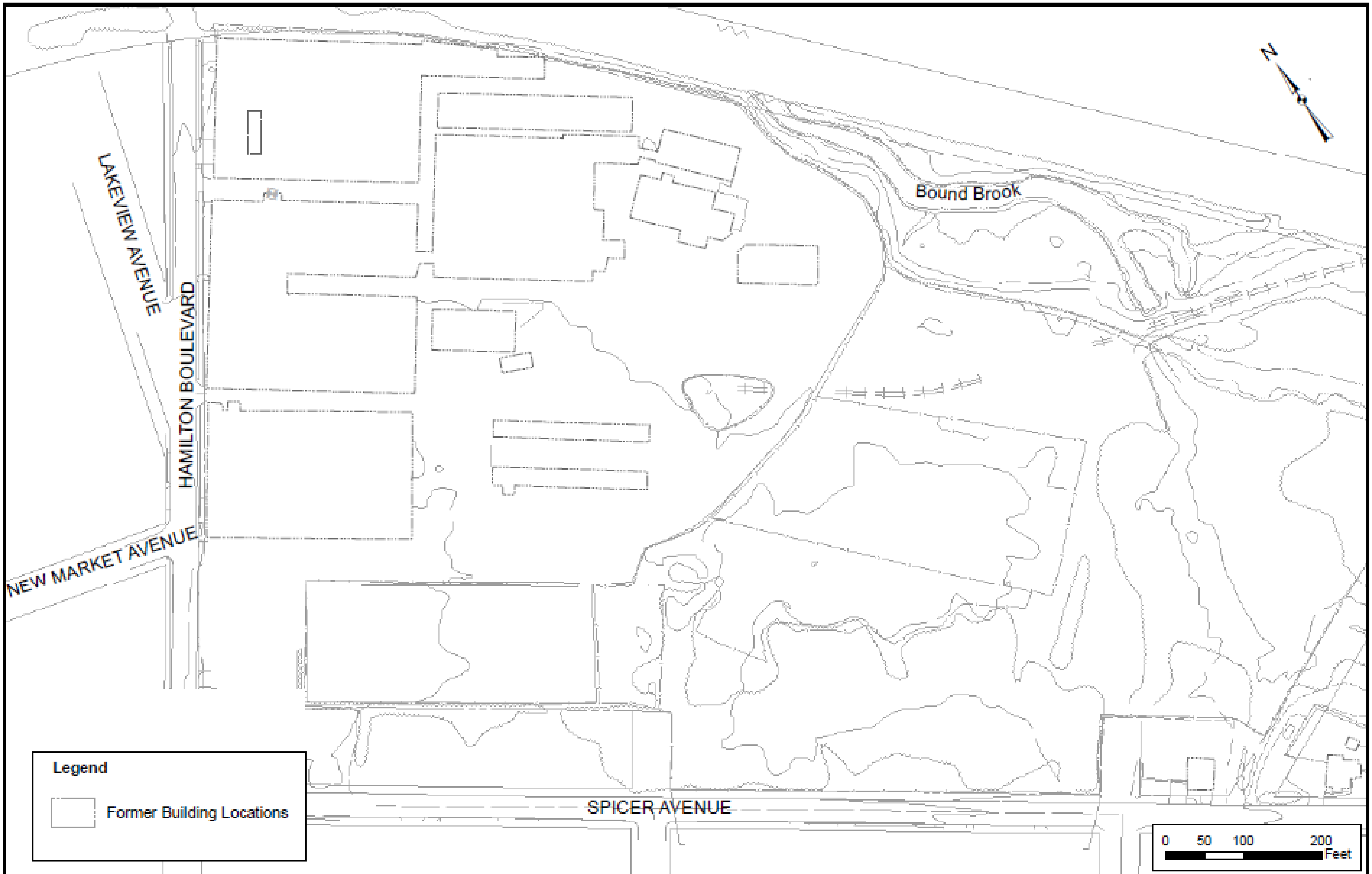
July 2010

Figure 1-2



SOURCE: U.S.G.S. TOPOGRAPHIC MAP,
7.5 MINUTE SERIES, PLAINFIELD, NEW JERSEY
QUADRANGLE, 1955, PHOTOREVISED 1981

MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	**Former CDE Facility Location Map** *OU4 Remedial Investigation/Feasibility Study*	July 2010 Figure 2-1



MALCOLM PIRNIE

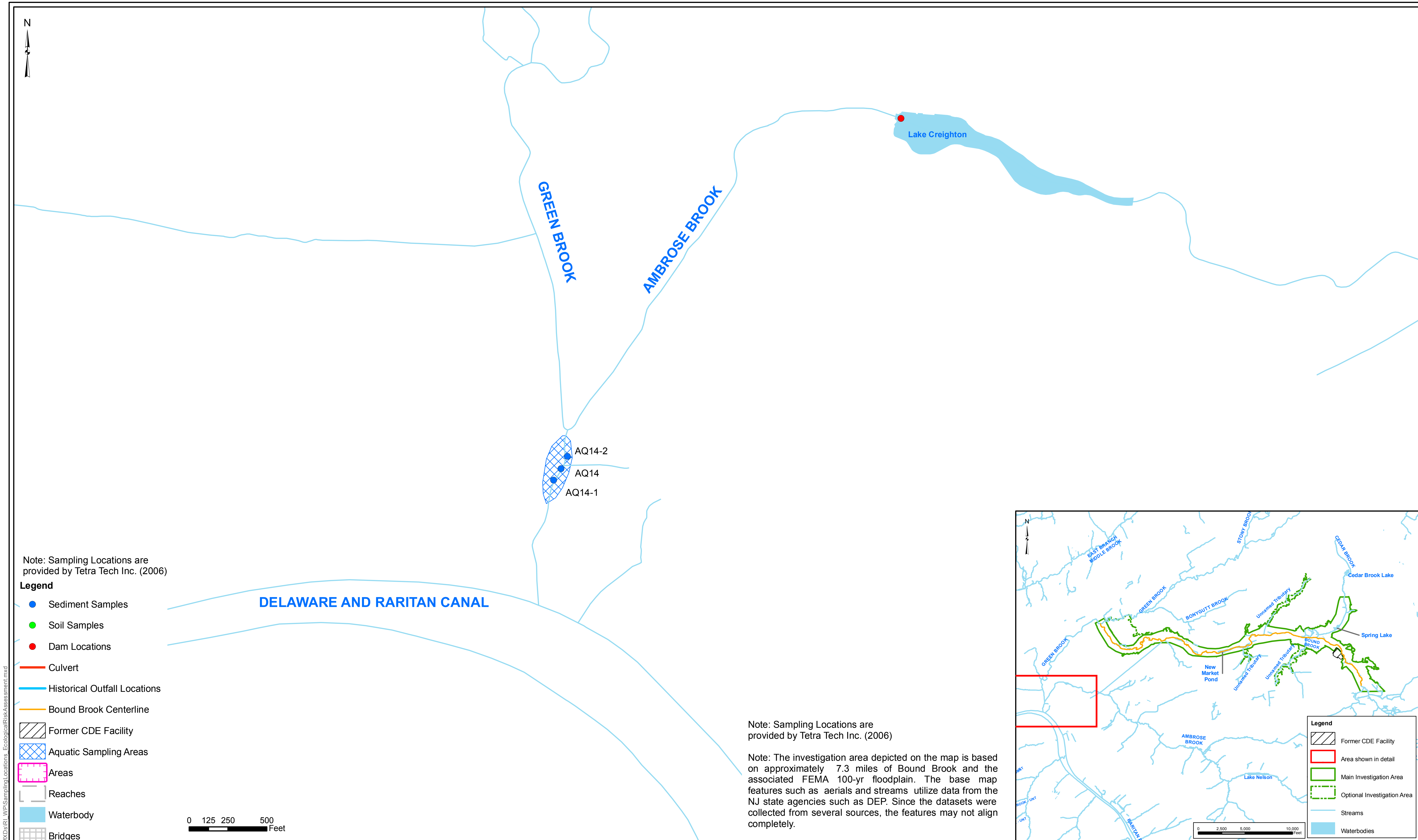
Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Former CDE Facility Plan

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 2-2



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MALCOLM PIRNIE

Cornell-Dubilier Electronics Superfund Site

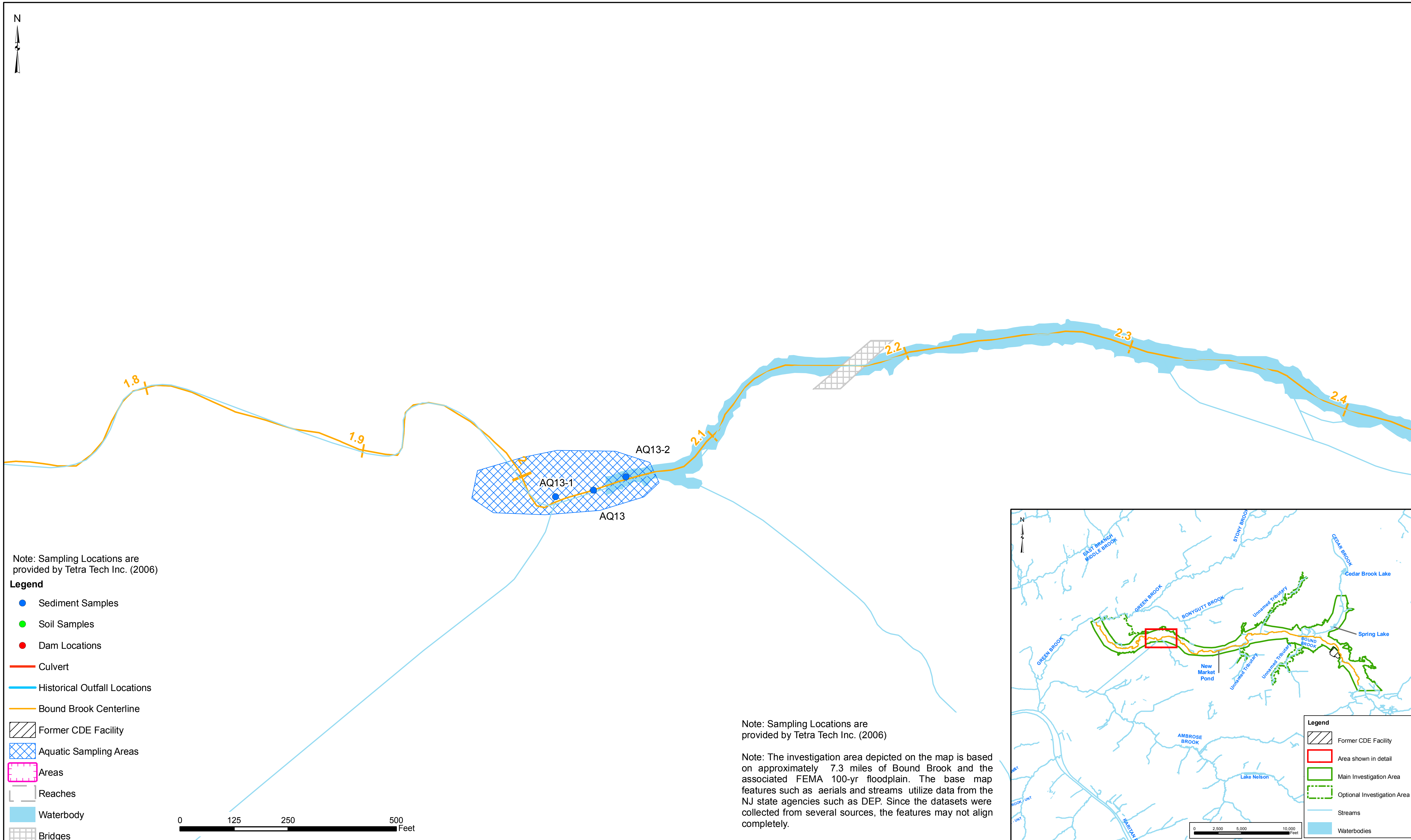
South Plainfield, New Jersey

Sample Locations (1997) for the USEPA Ecological Risk Assessment

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 2-3a



MALCOLM PIRNIE

Cornell-Dubilier Electronics Superfund Site

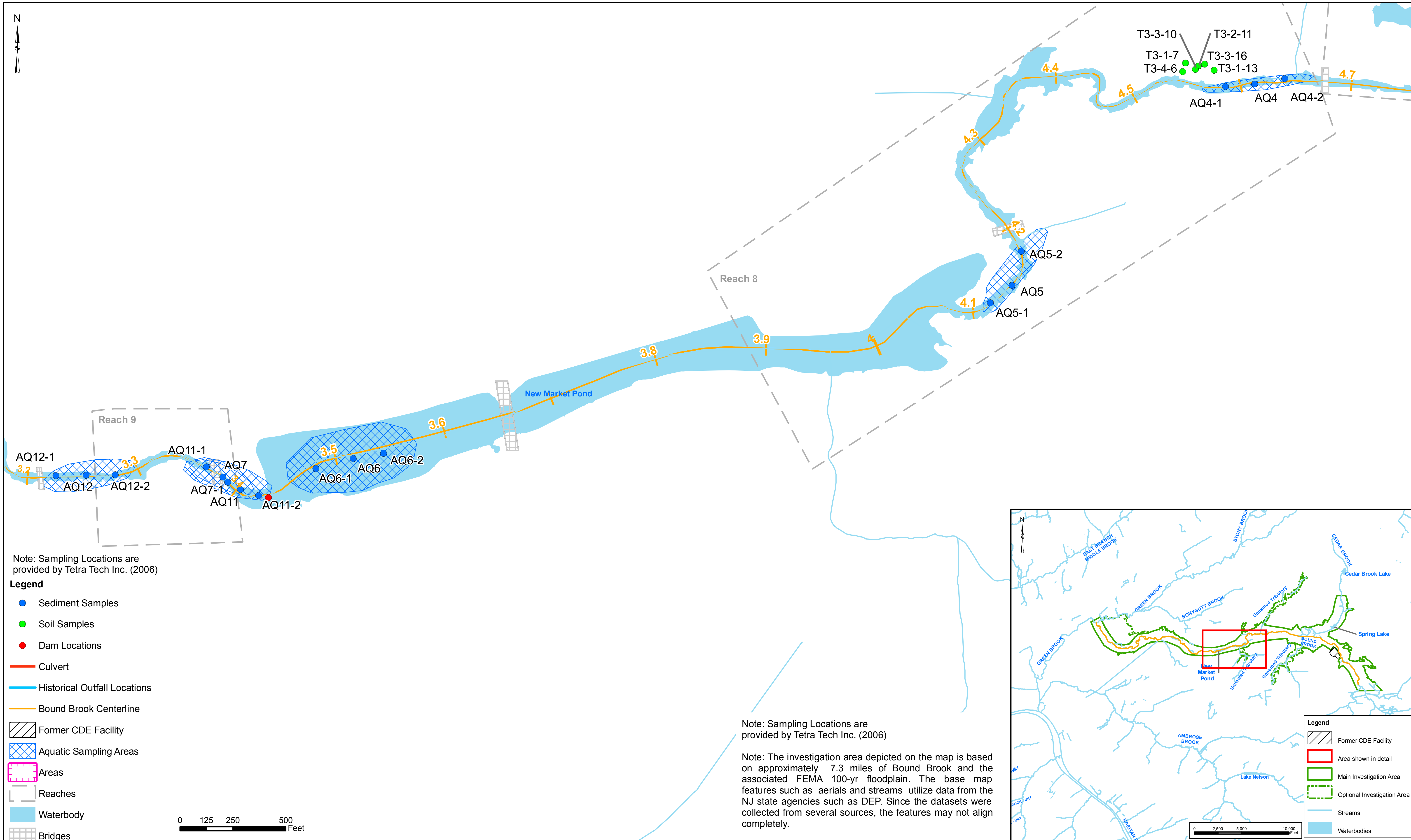
South Plainfield, New Jersey

Sample Locations (1997) for the USEPA Ecological Risk Assessment

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 2-3b



MALCOLM PIRNIE

Cornell-Dubilier Electronics Superfund Site

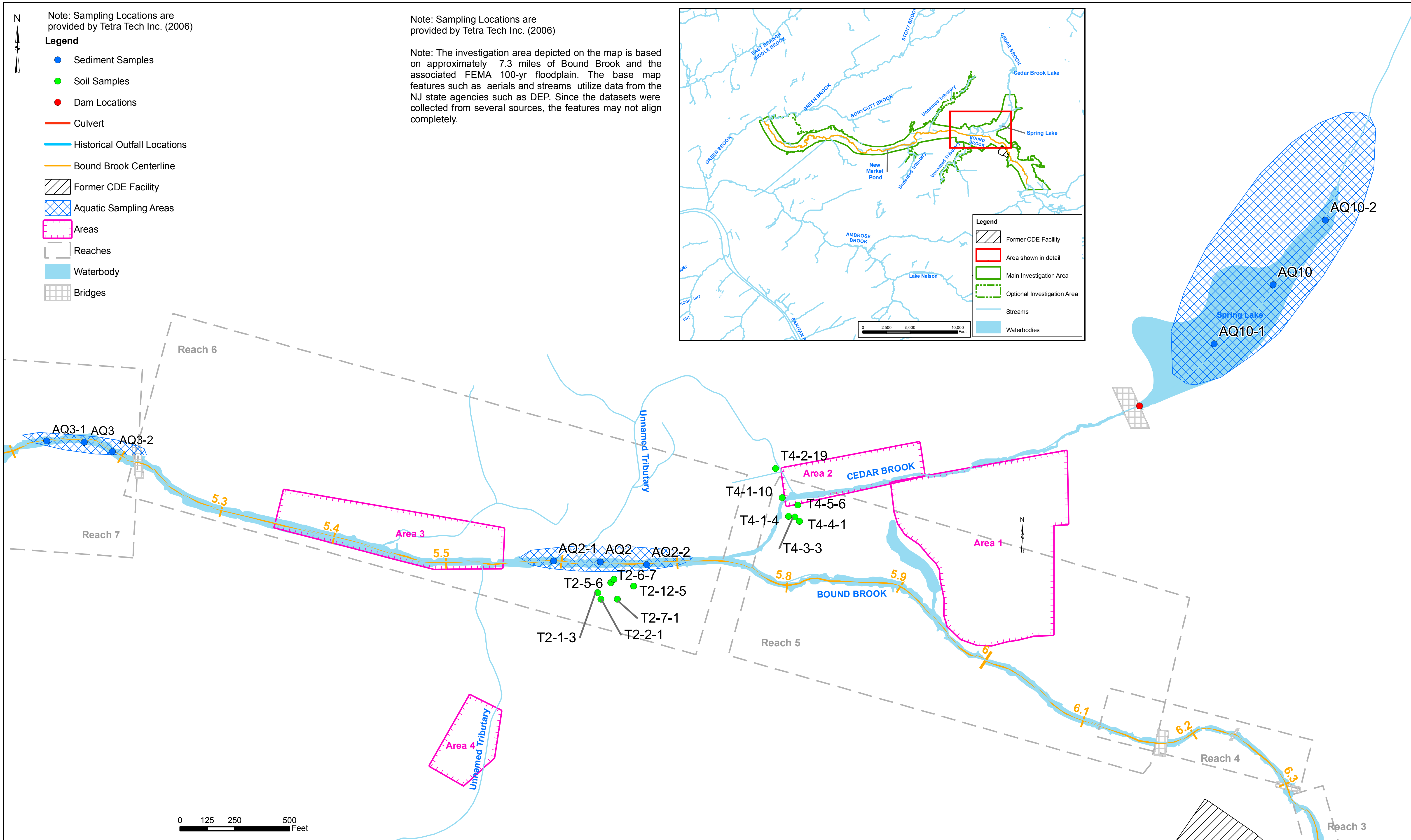
South Plainfield, New Jersey

Sample Locations (1997) for the USEPA Ecological Risk Assessment

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 2-3c



MALCOLM PIRNIE

Cornell-Dubilier Electronics Superfund Site

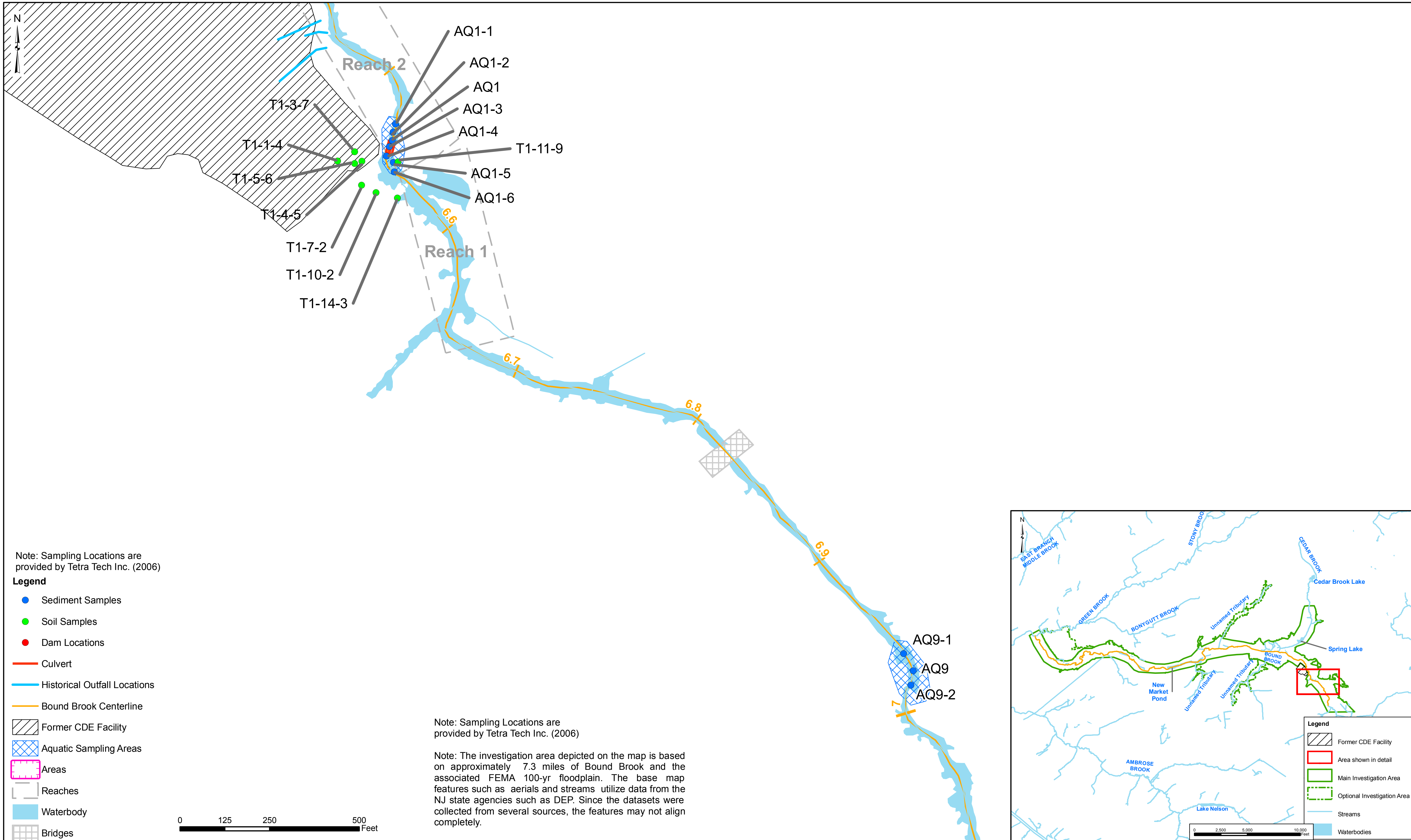
South Plainfield, New Jersey

Sample Locations (1997) for the USEPA Ecological Risk Assessment

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 2-3d



Note: Sampling Locations are provided by Tetra Tech Inc. (2006)

Note: Sampling Locations are provided by Tetra Tech Inc. (2006)

Note: The investigation area depicted on the map is based on approximately 7.3 miles of Bound Brook and the associated FEMA 100-yr floodplain. The base map features such as aerials and streams utilize data from the NJ state agencies such as DEP. Since the datasets were collected from several sources, the features may not align completely.

MALCOLM PIRNIE

Cornell-Dubilier Electronics Superfund Site

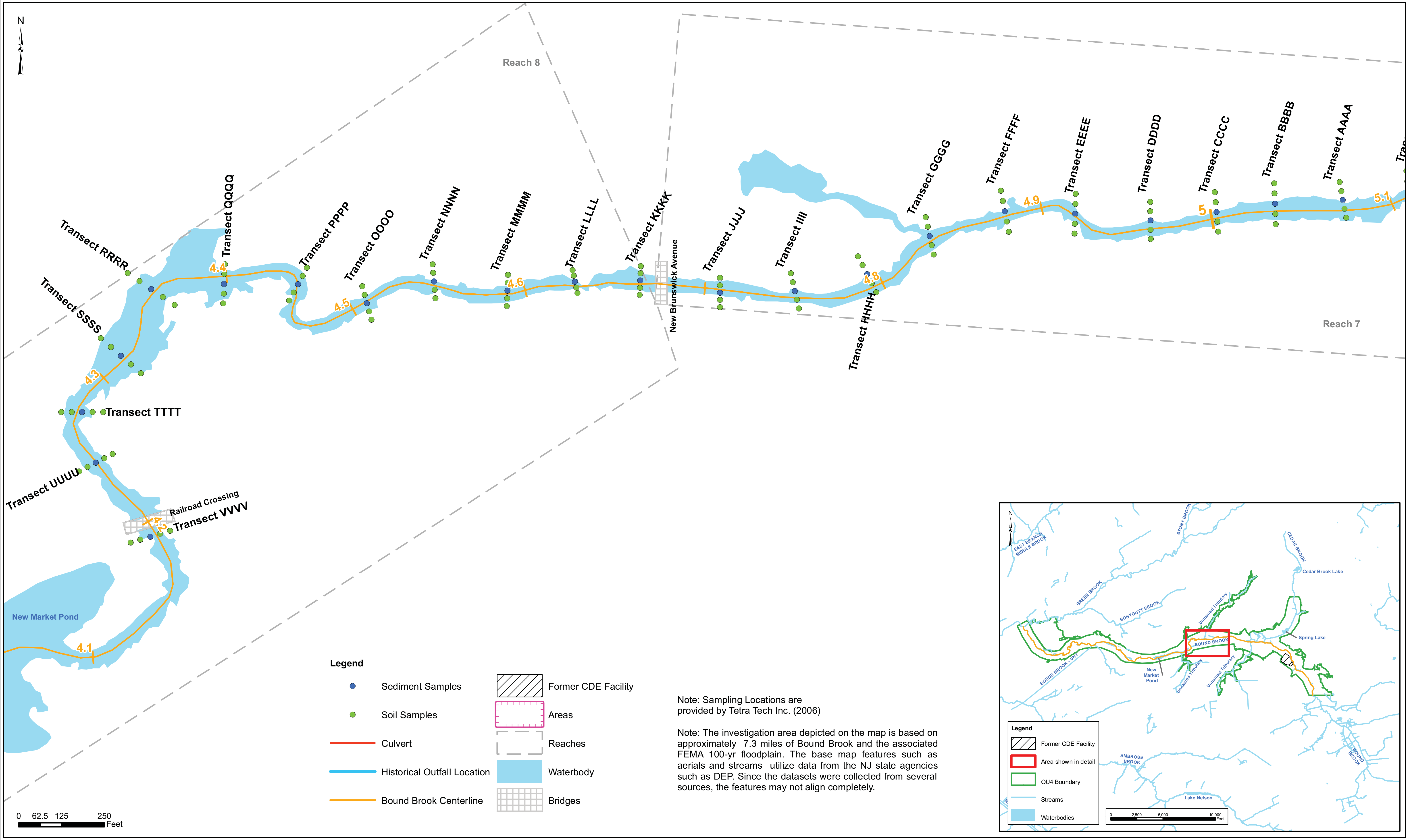
South Plainfield, New Jersey

Sample Locations (1997) for the USEPA Ecological Risk Assessment

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 2-3 e



MALCOLM PIRNIE

Cornell-Dubilier Electronics Superfund Site

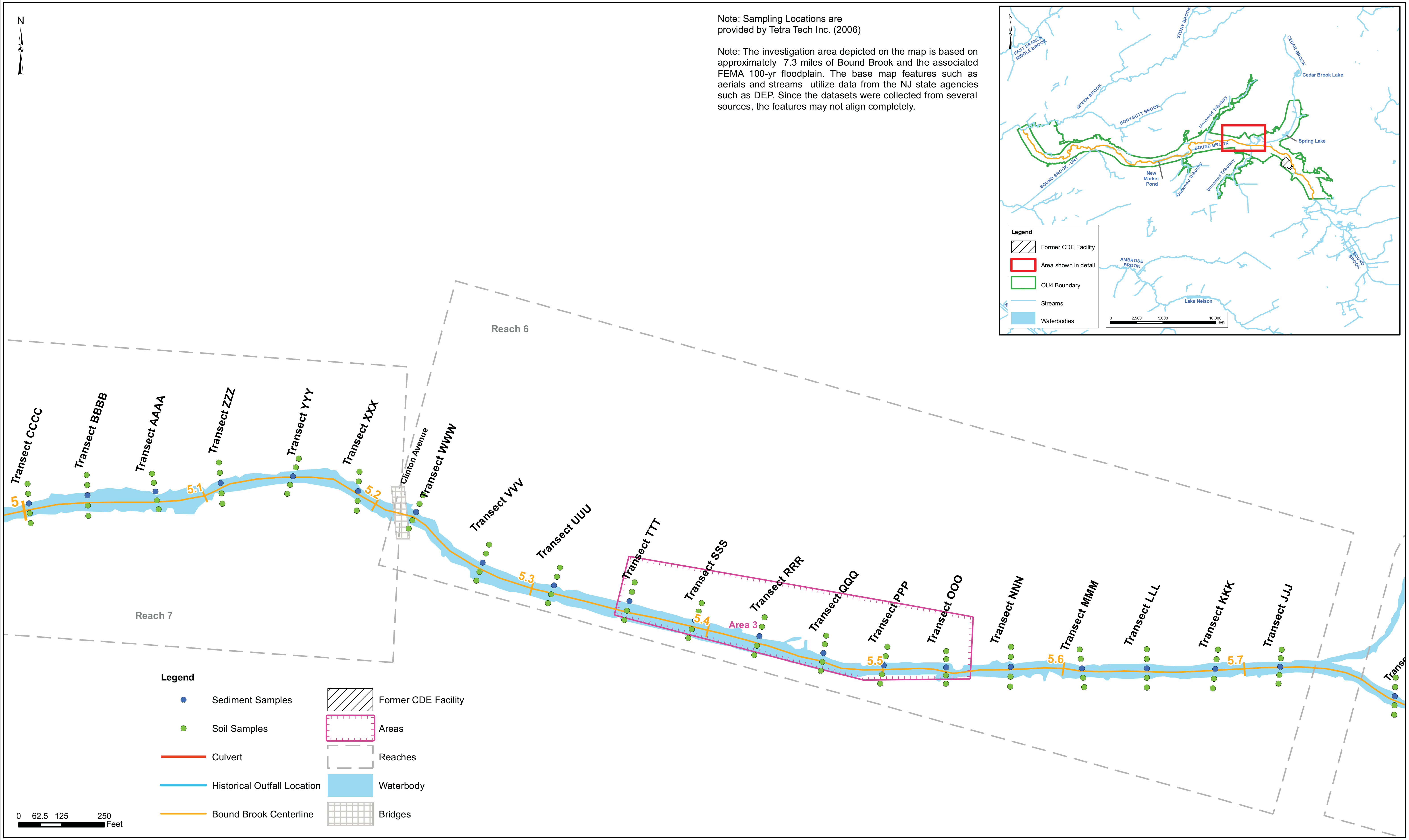
South Plainfield, New Jersey

Sample Locations (1997) for the USEPA Soil and Sediment Sampling Program

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 2-4a



MALCOLM PIRNIE

Cornell-Dubilier Electronics Superfund Site

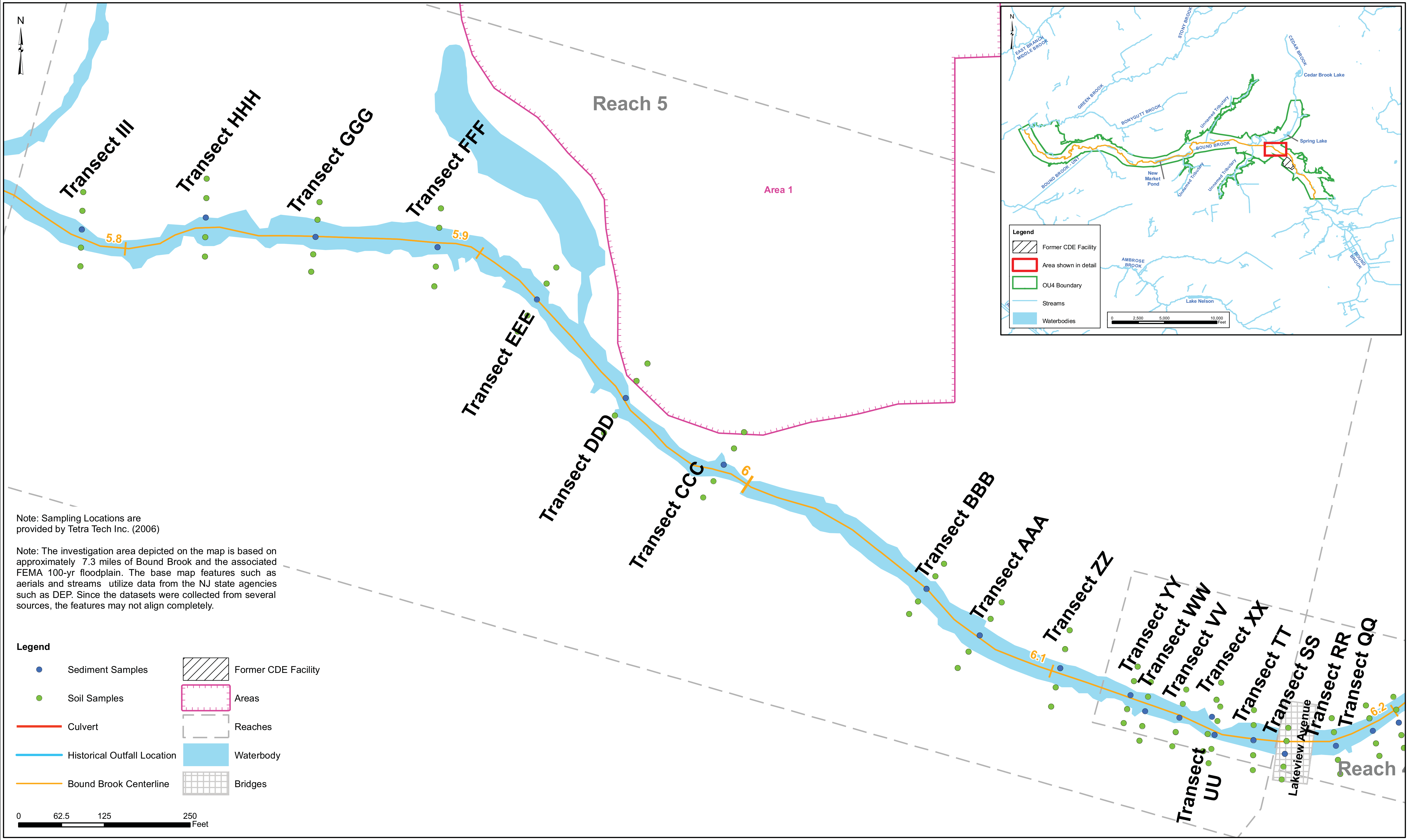
South Plainfield, New Jersey

Sample Locations (1997) for the USEPA Soil and Sediment Sampling Program

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 2-4b



MALCOLM PIRNIE

Cornell-Dubilier Electronics Superfund Site

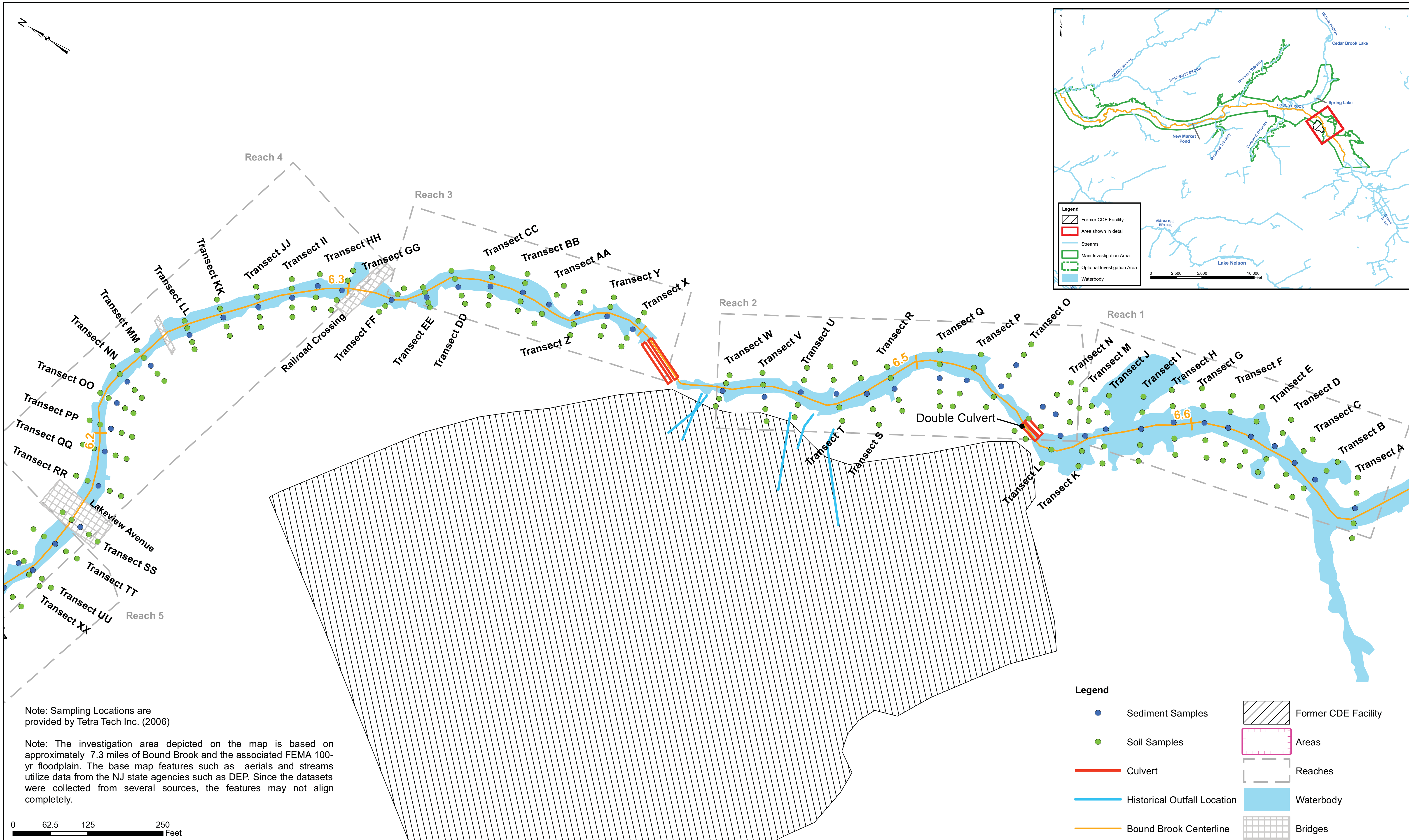
South Plainfield, New Jersey

Sample Locations (1997) for the USEPA Soil and Sediment Sampling Program

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 2-4c



Note: Sampling Locations are provided by Tetra Tech Inc. (2006)

Note: The investigation area depicted on the map is based on approximately 7.3 miles of Bound Brook and the associated FEMA 100-yr floodplain. The base map features such as aerials and streams utilize data from the NJ state agencies such as DEP. Since the datasets were collected from several sources, the features may not align completely.

MALCOLM PIRNIE

Cornell-Dubilier Electronics Superfund Site

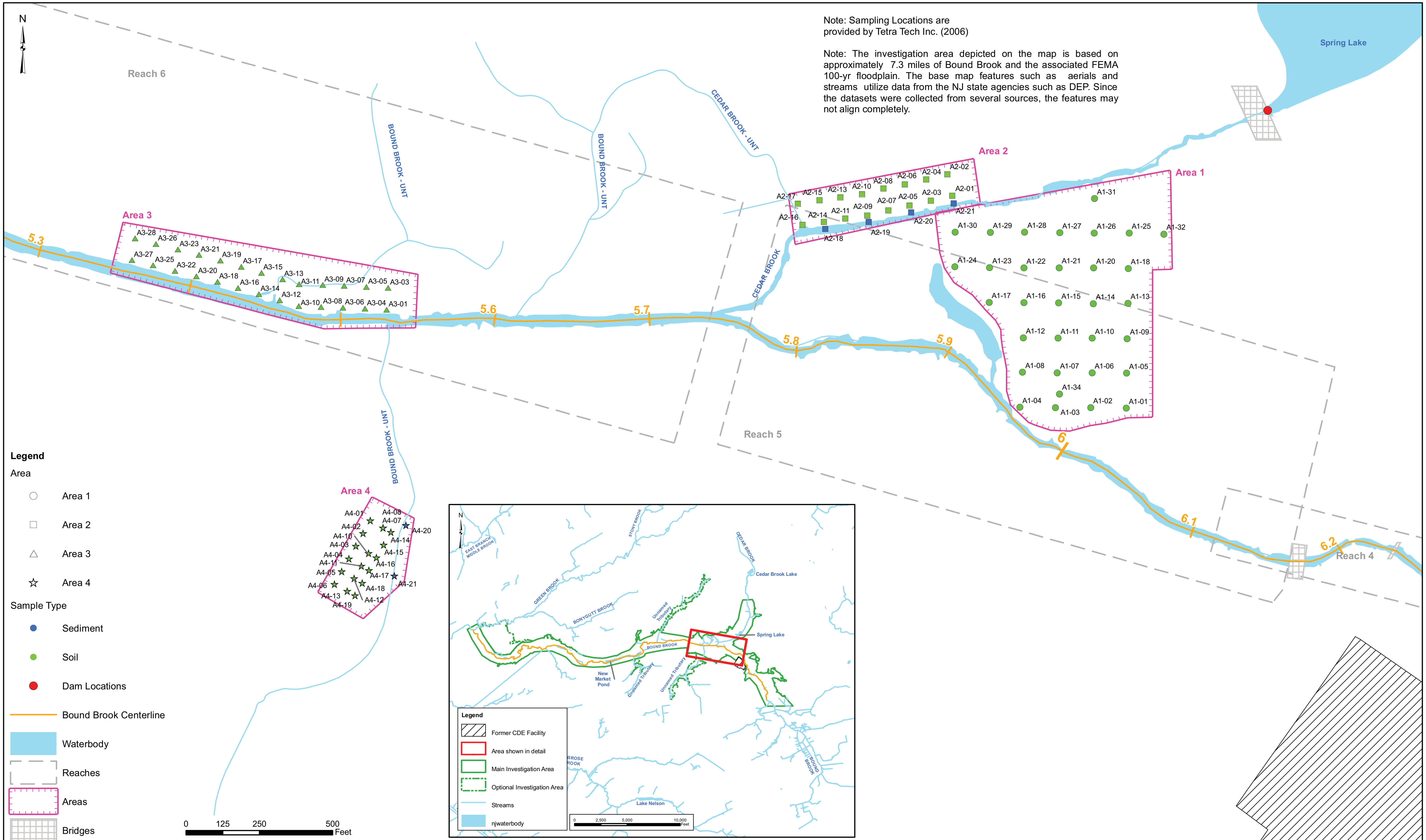
South Plainfield, New Jersey

Sample Locations (1997) for the USEPA Soil and Sediment Sampling Program

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 2-4d



Cornell-Dubilier Electronics Superfund Site
South Plainfield, New Jersey

MALCOLM PIRNIE

Sample Locations (1999) for the USEPA Soil and Sediment Sampling Program

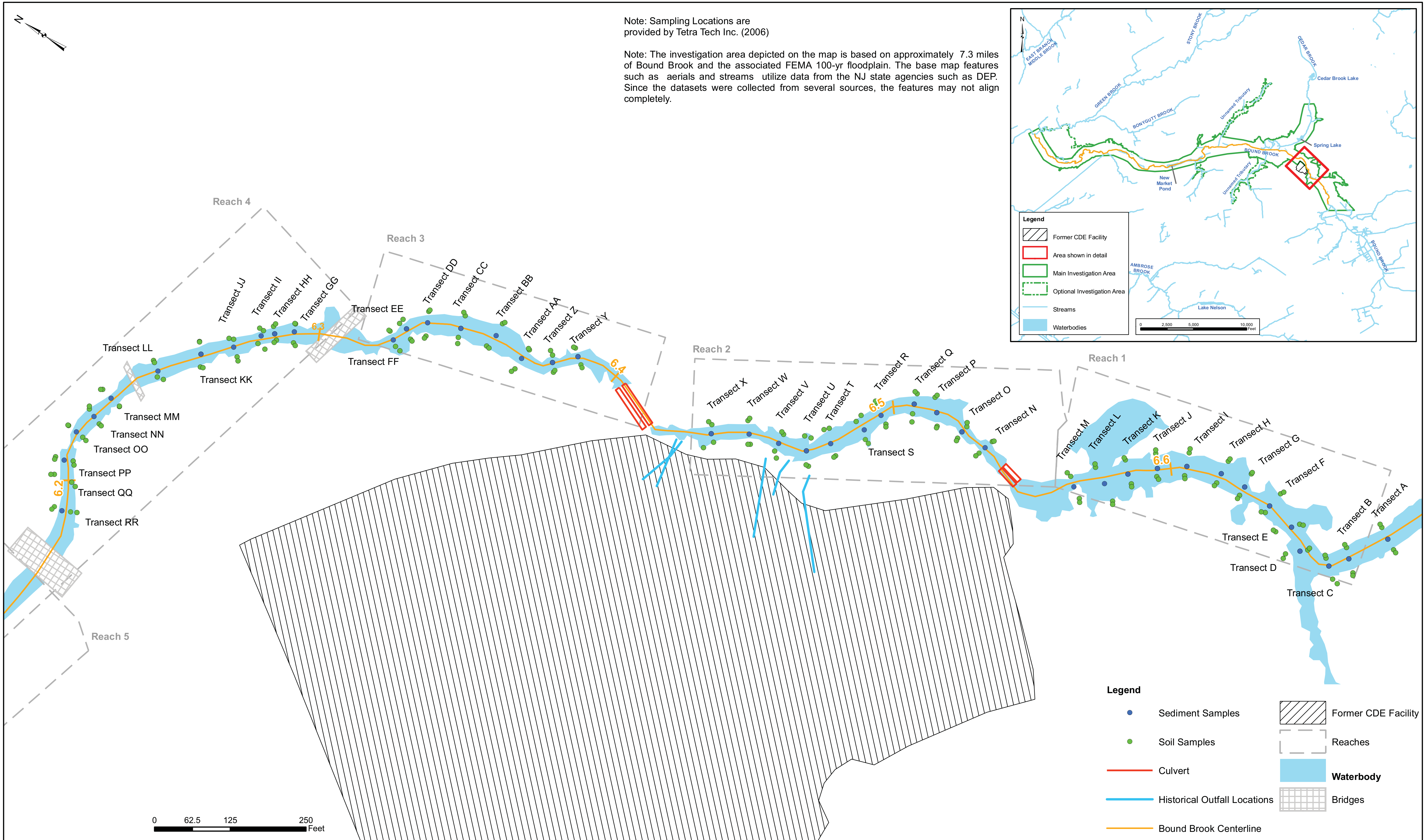
OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 2-5

Note: Sampling Locations are provided by Tetra Tech Inc. (2006)

Note: The investigation area depicted on the map is based on approximately 7.3 miles of Bound Brook and the associated FEMA 100-yr floodplain. The base map features such as aerials and streams utilize data from the NJ state agencies such as DEP. Since the datasets were collected from several sources, the features may not align completely.



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Cornell-Dubilier Electronics Superfund Site

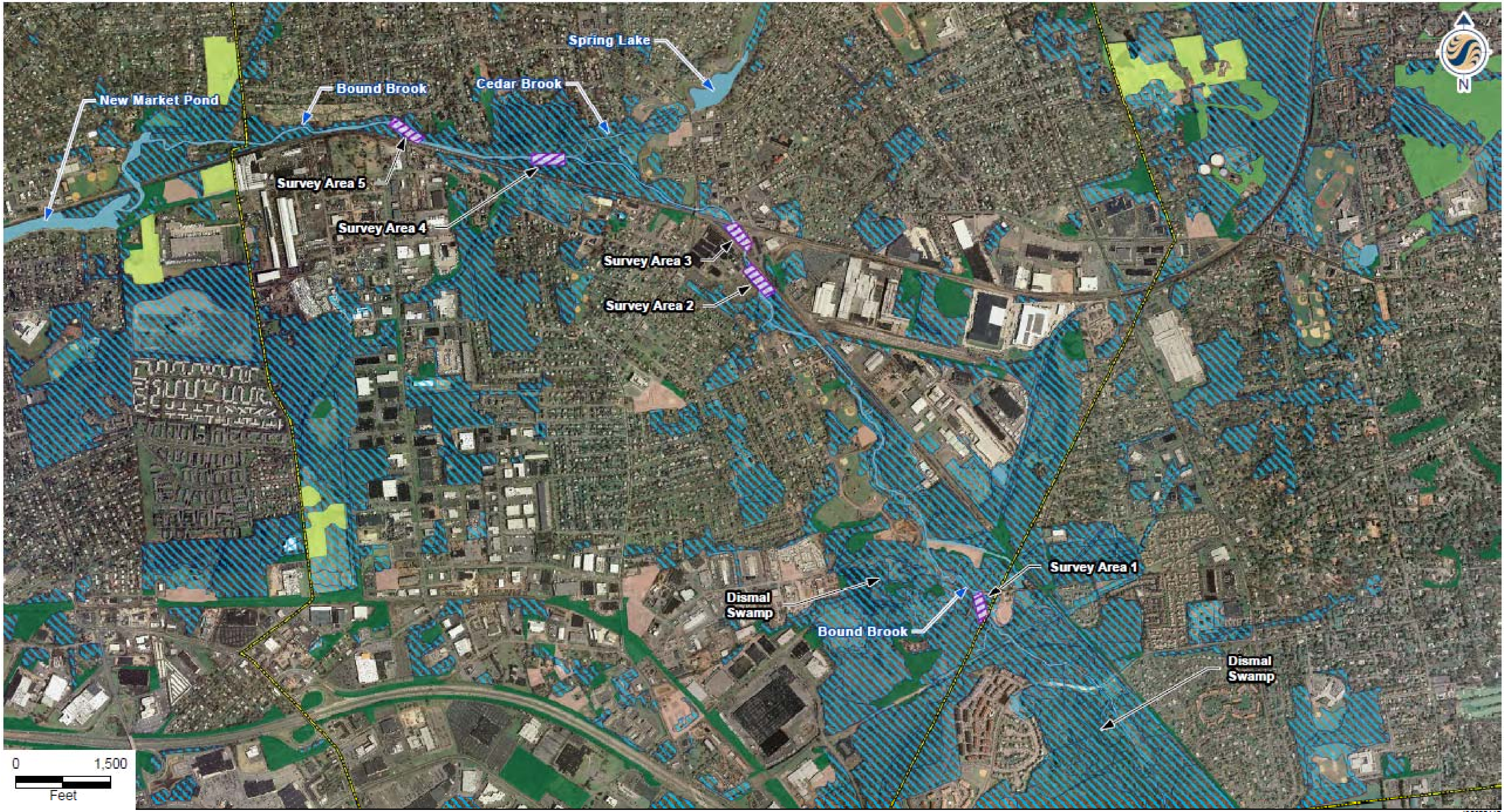
South Plainfield, New Jersey

Sample Locations (2007-08) for the USEPA Soil and Sediment Sampling Program

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 2-6



Stantec Consulting Services Inc.
30 Park Drive
Topsham, ME USA
04086
Phone (207) 729-1199
Fax: (207) 729-2715
www.stantec.com

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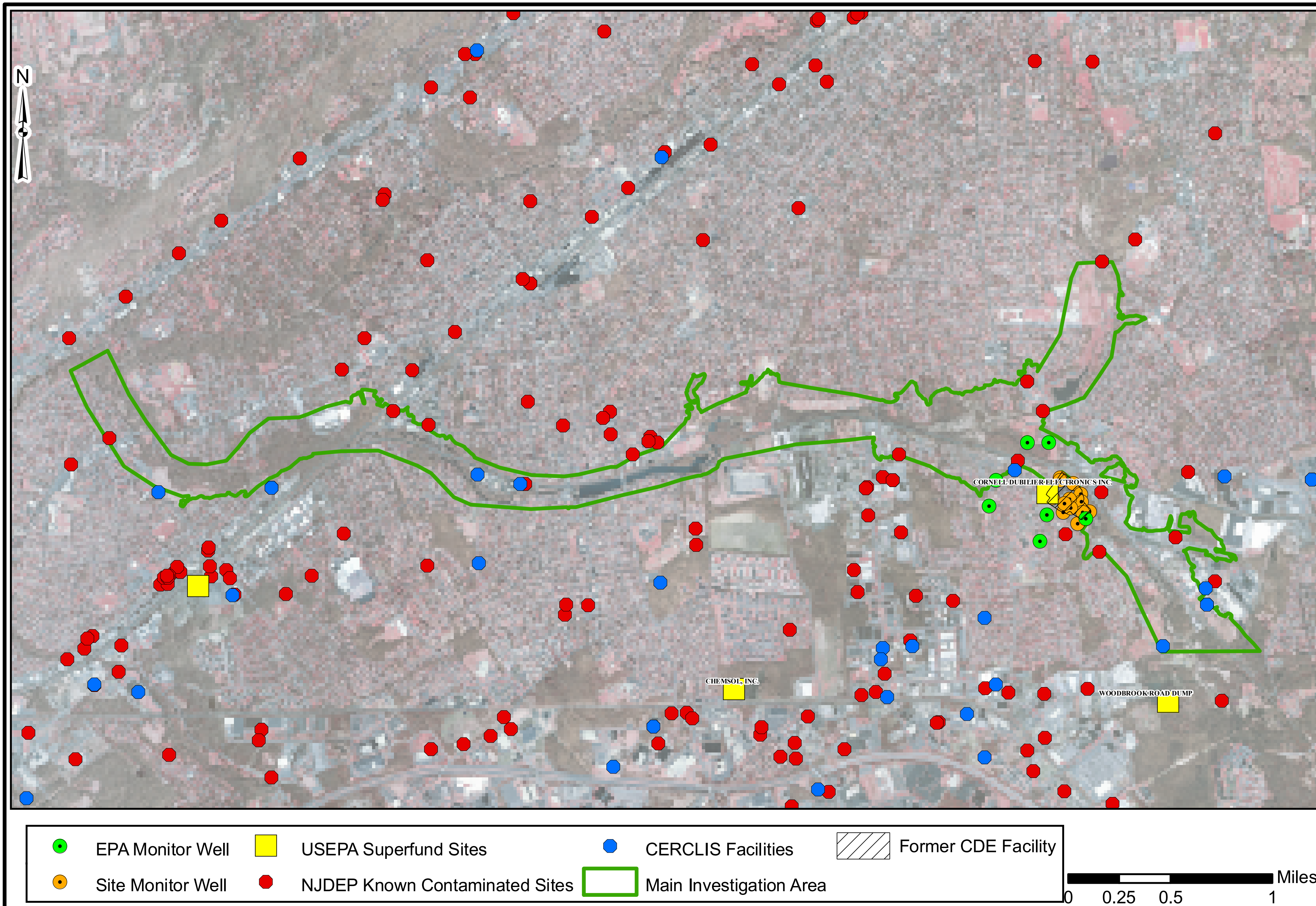
Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Bound Brook Ecosystem Wildlife Survey

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 2-7



MALCOLM PIRNIE

Cornell-Dubilier Electronics Superfund Site

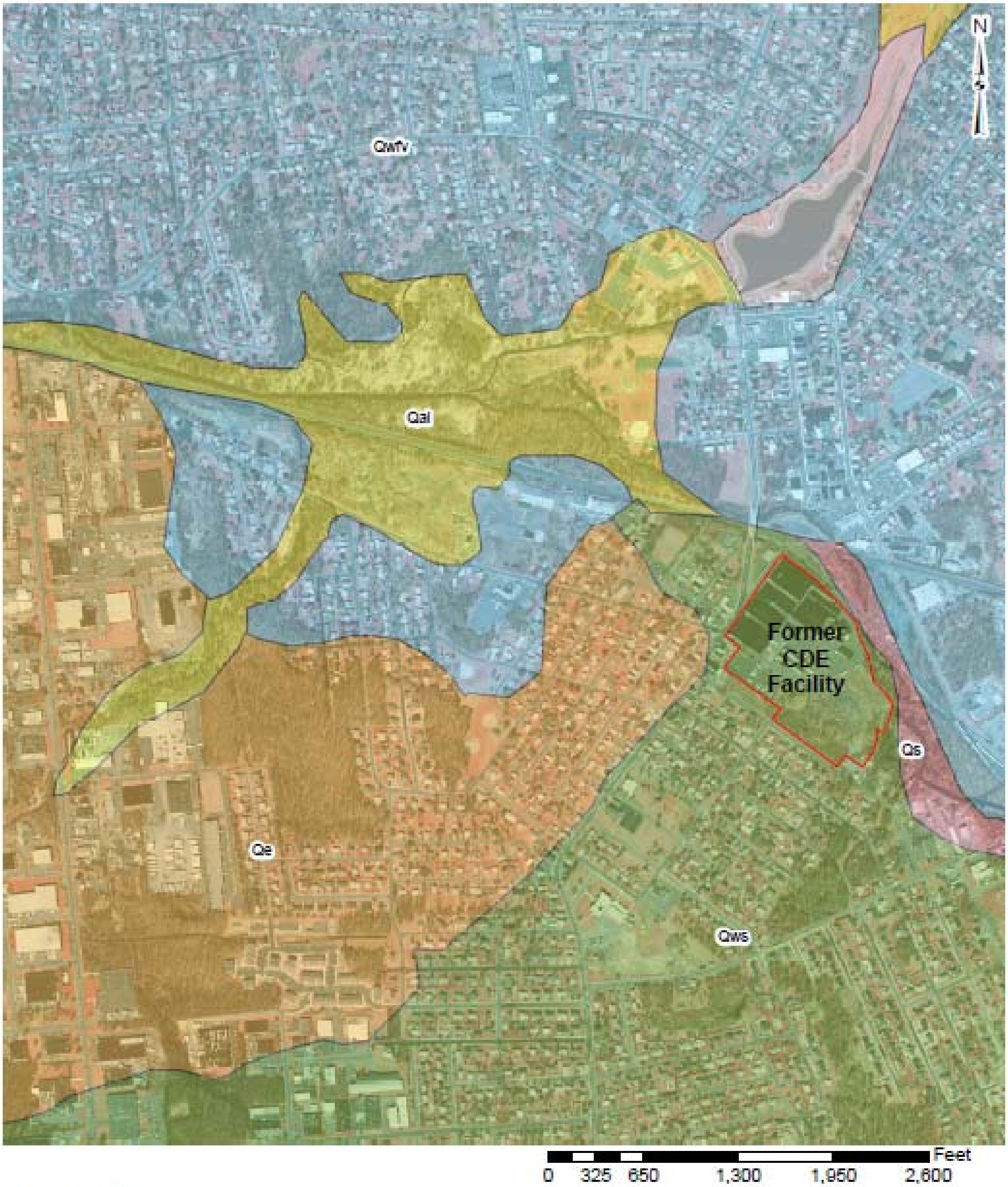
South Plainfield, New Jersey

Location Of Other Potential Sources

OU4 Remedial Investigation/Feasibility Study

July 2010

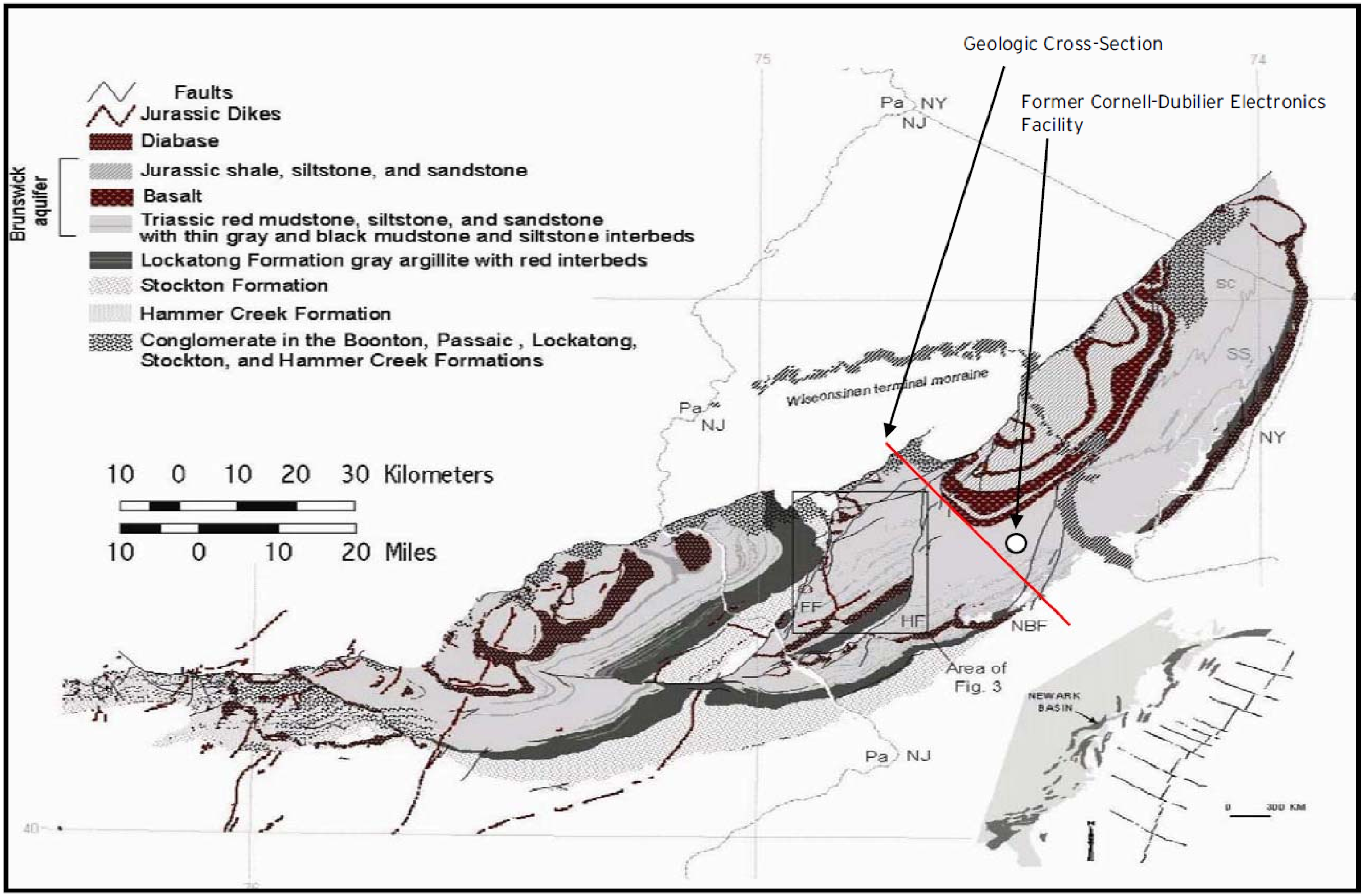
Figure 2-8



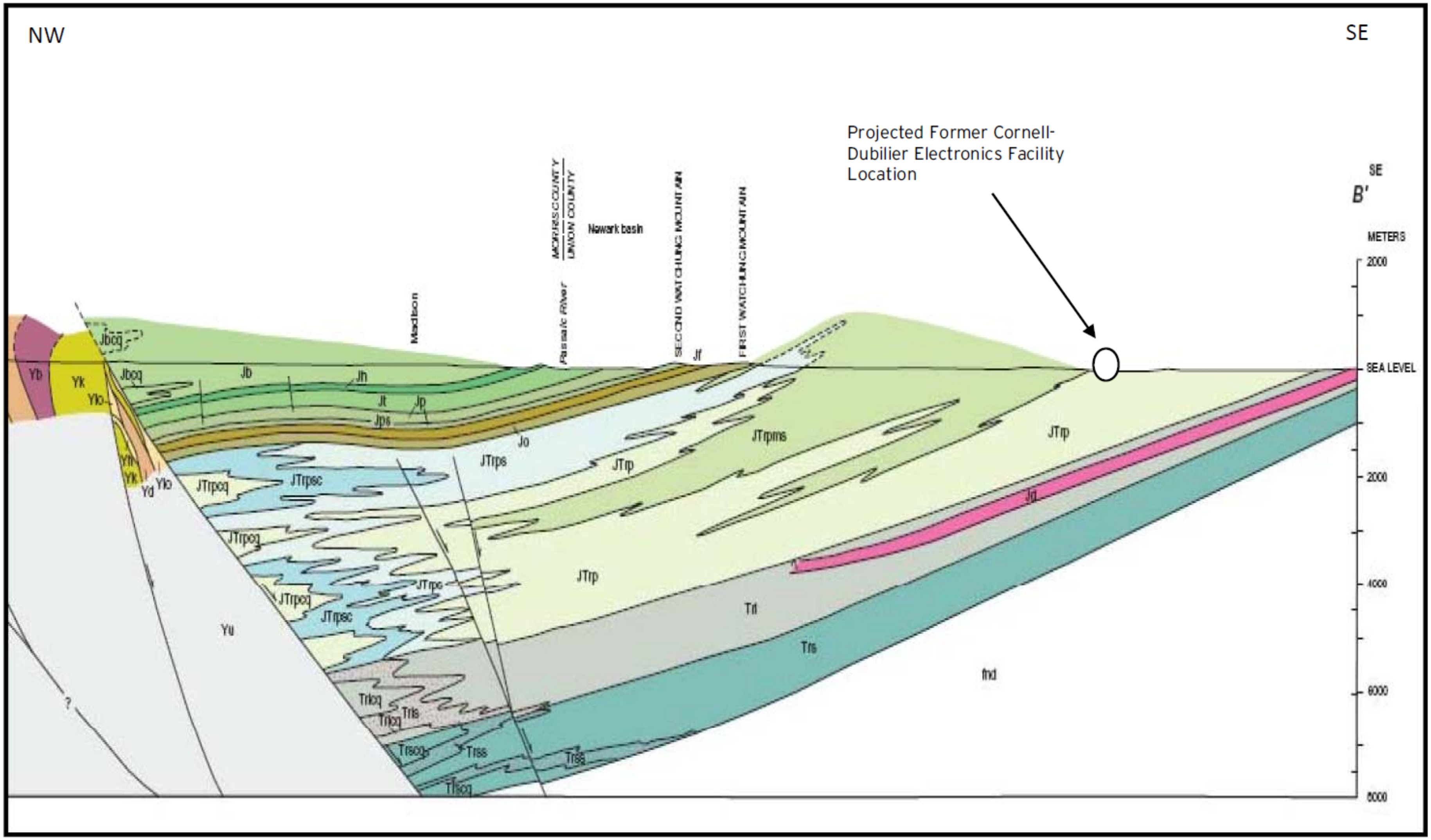
Qal = Alluvium
Qe = Eolian Deposits
Qs = Swamp and Marsh Deposits
Qwfv = Late Wisconsinan Glaciofluvial Plain Deposits
Qws = Weathered Shale, Mudstone, and Sandstone

Source: NJDEP GIS Database

MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	**Surface Geology Map** *OU4 Remedial Investigation/Feasibility Study*	July 2010 Figure 3-1



MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	**Cross-Section of a Selected Portion of the Newark Basin** *OU4 Remedial Investigation/Feasibility Study*	July 2010 Figure 3-2



Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Cross-Section of a Selected Portion of the Newark Basin

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 3-3

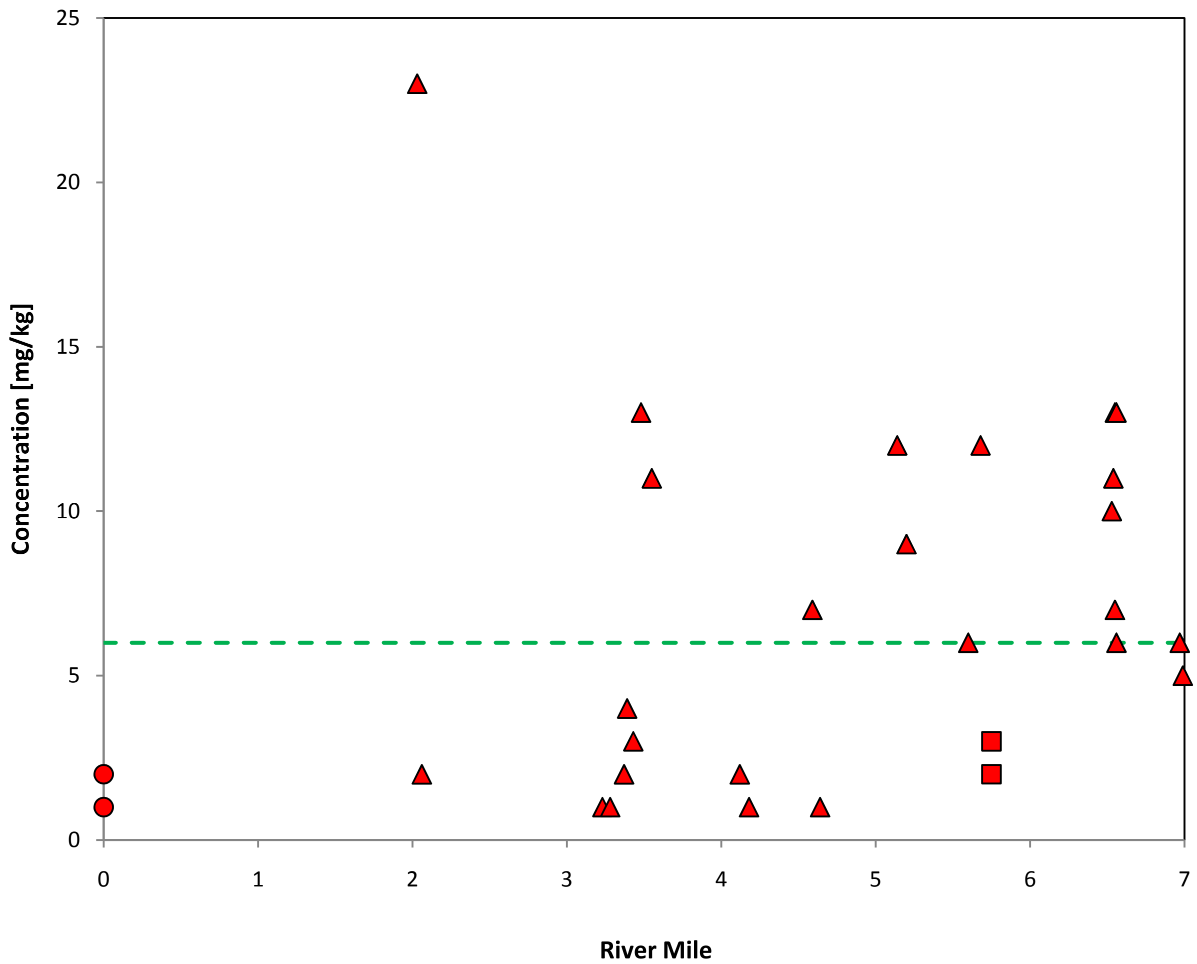
JTrp = Passaic Formation
JTrpma = Passaic Formation Mudstone Facies

Fault

Strike and Dip of Bedding

Source: NJDEP GIS Database

MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	**Bedrock Geologic Map** *OU4 Remedial Investigation/Feasibility Study*	July 2010 Figure 3-4



Colors Legend

- ▲ 1997- Bound Brook
- ● 1997- Green Brook
- ■ 1997- Cedar Brook
- - - - Lowest Effects Level

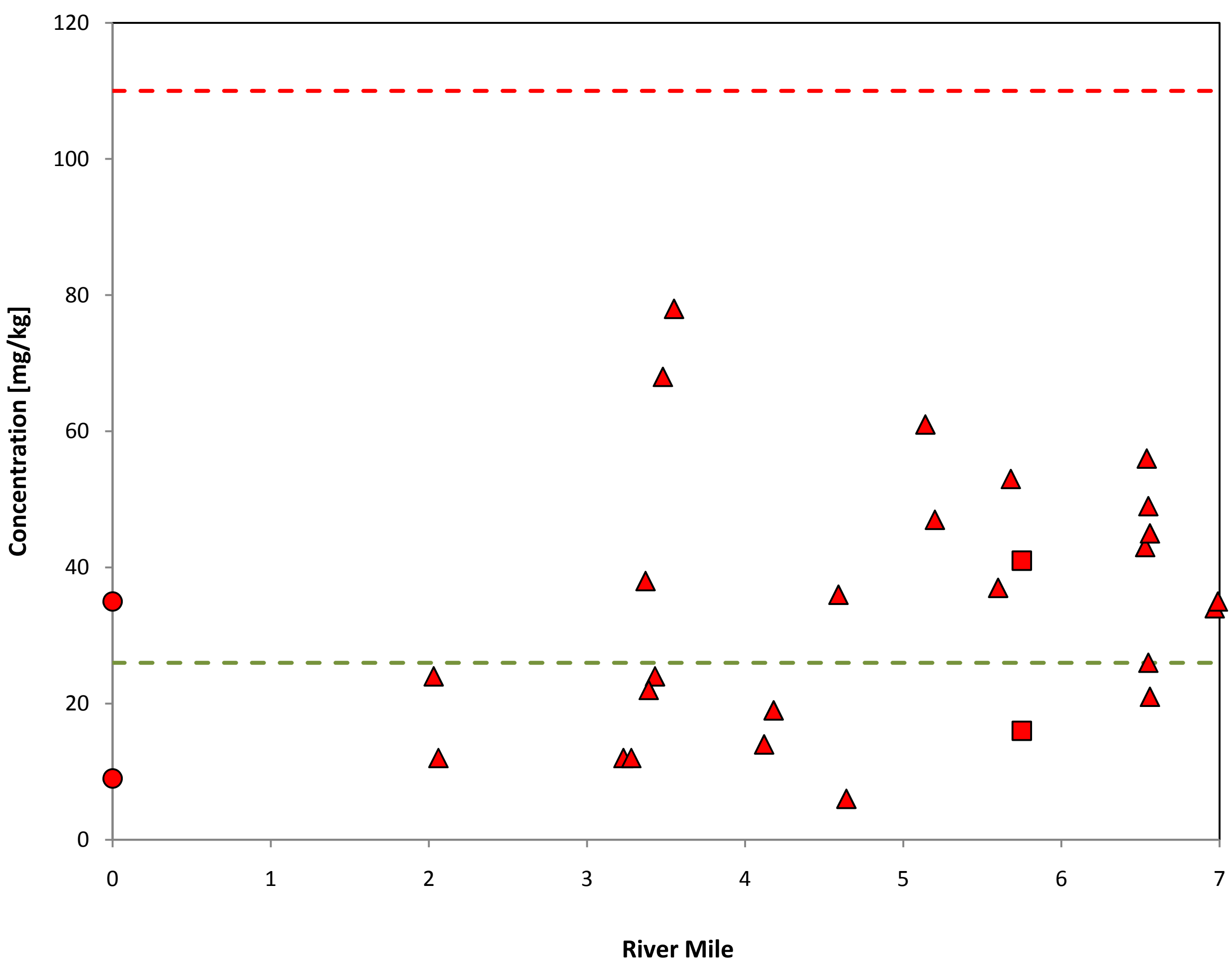
Symbols Legend

- △ Bound Brook
- ○ Green Brook
- □ Cedar brook

Notes:

1. Severe Effects Level (SEL) for arsenic is 33 mg/kg (New Jersey Department of Environmental Protection, 1998).
2. Samples collected in Cedar Brook were plotted at River Mile 5.75.
3. Samples collected in Green Brook were plotted at River Mile 0.
4. mg/kg = milligrams/kilogram

MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	**Surface Sediment:** **Total Arsenic Concentration vs River Mile** *OU4 Remedial Investigation/Feasibility Study*	July 2010 Figure 3-5a



Colors Legend

- 1997- Bound Brook
- 1997- Green Brook
- 1997- Cedar Brook
- Lowest Effects Level
- Severe Effects Level

Symbols Legend

- Bound Brook
- Green Brook
- Cedar brook

Notes:

1. Samples collected in Cedar Brook were plotted at River Mile 5.75.
2. Samples collected in Green Brook were plotted at River Mile 0.
3. mg/kg = milligrams/kilogram

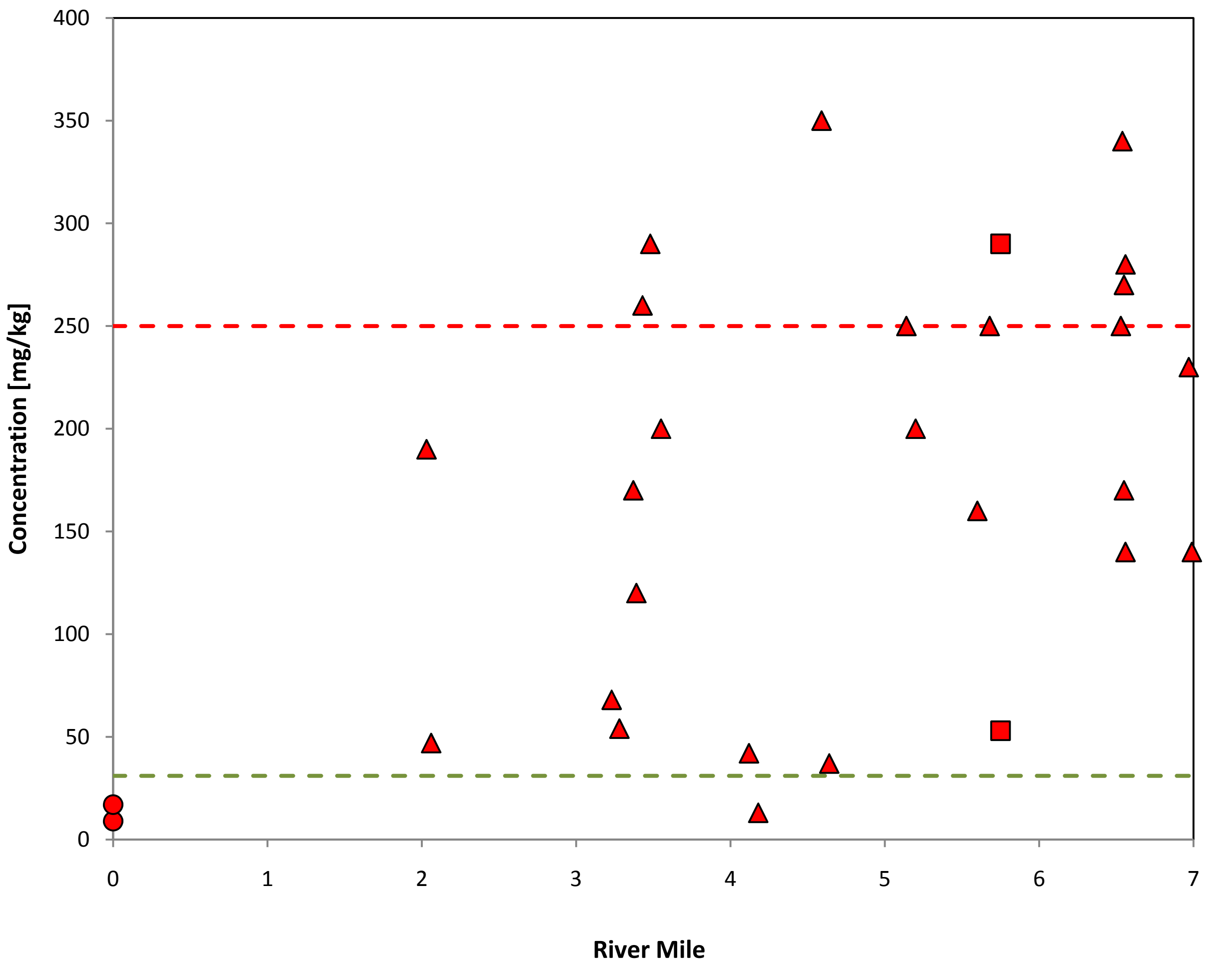
MALCOLM PIRNIE

Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Surface Sediment:
Total Chromium Concentration vs River Mile
OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 3-5b



Colors Legend

- ▲ 1997- Bound Brook
- ● 1997- Green Brook
- ■ 1997- Cedar Brook
- - - - Lowest Effects Level
- - - - Severe Effects Level

Symbols Legend

- △ Bound Brook
- ○ Green Brook
- □ Cedar brook

Notes:

1. Samples collected in Cedar Brook were plotted at River Mile 5.75.
2. Samples collected in Green Brook were plotted at River Mile 0.
3. mg/kg = milligrams/kilogram

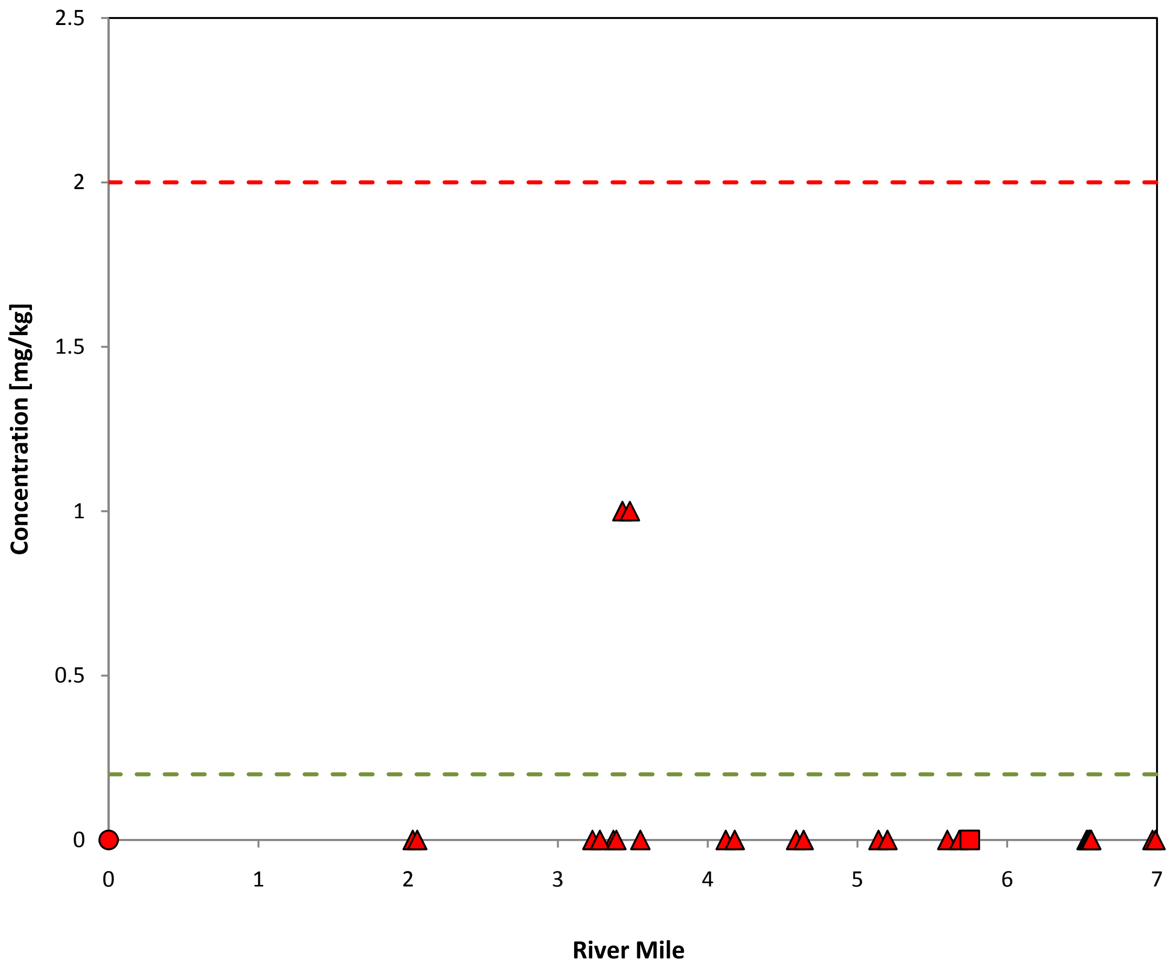
MALCOLM PIRNIE

Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Surface Sediment:
Total Lead Concentration vs River Mile
OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 3-5c



Colors Legend

- ▲ 1997- Bound Brook
- ● 1997- Green Brook
- ■ 1997- Cedar Brook
- Lowest Effects Level
- Severe Effects Level

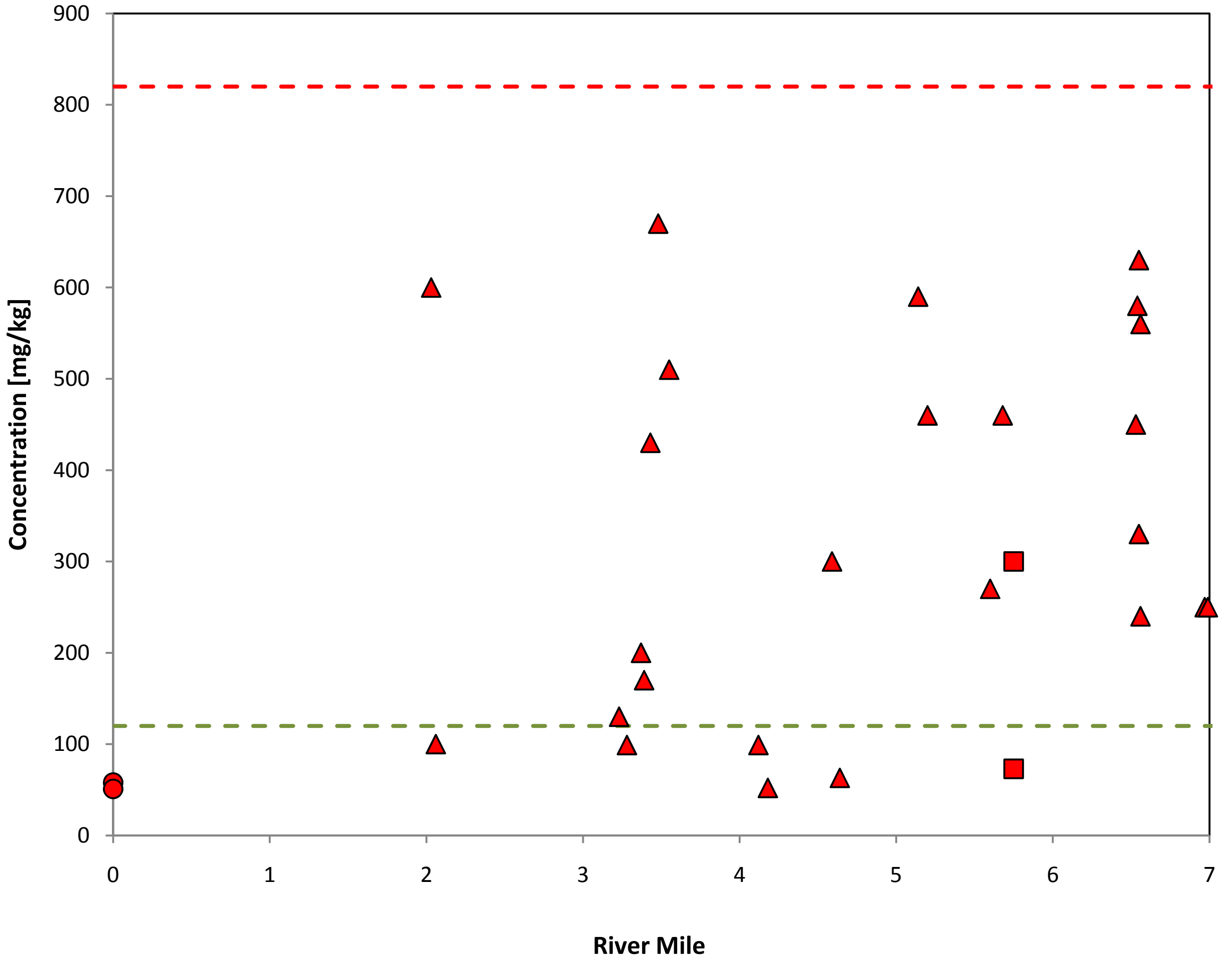
Symbols Legend

- △ Bound Brook
- ○ Green Brook
- □ Cedar brook

Notes:

1. Samples collected in Cedar Brook were plotted at River Mile 5.75.
2. Samples collected in Green Brook were plotted at River Mile 0.
3. mg/kg = milligrams/kilogram

MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	**Surface Sediment:** **Total Mercury Concentration vs River Mile** *OU4 Remedial Investigation/Feasibility Study*	July 2010 Figure 3-5d



Colors Legend

- 1997- Bound Brook
- 1997- Green Brook
- 1997- Cedar Brook
- Lowest Effects Level
- Severe Effects Level

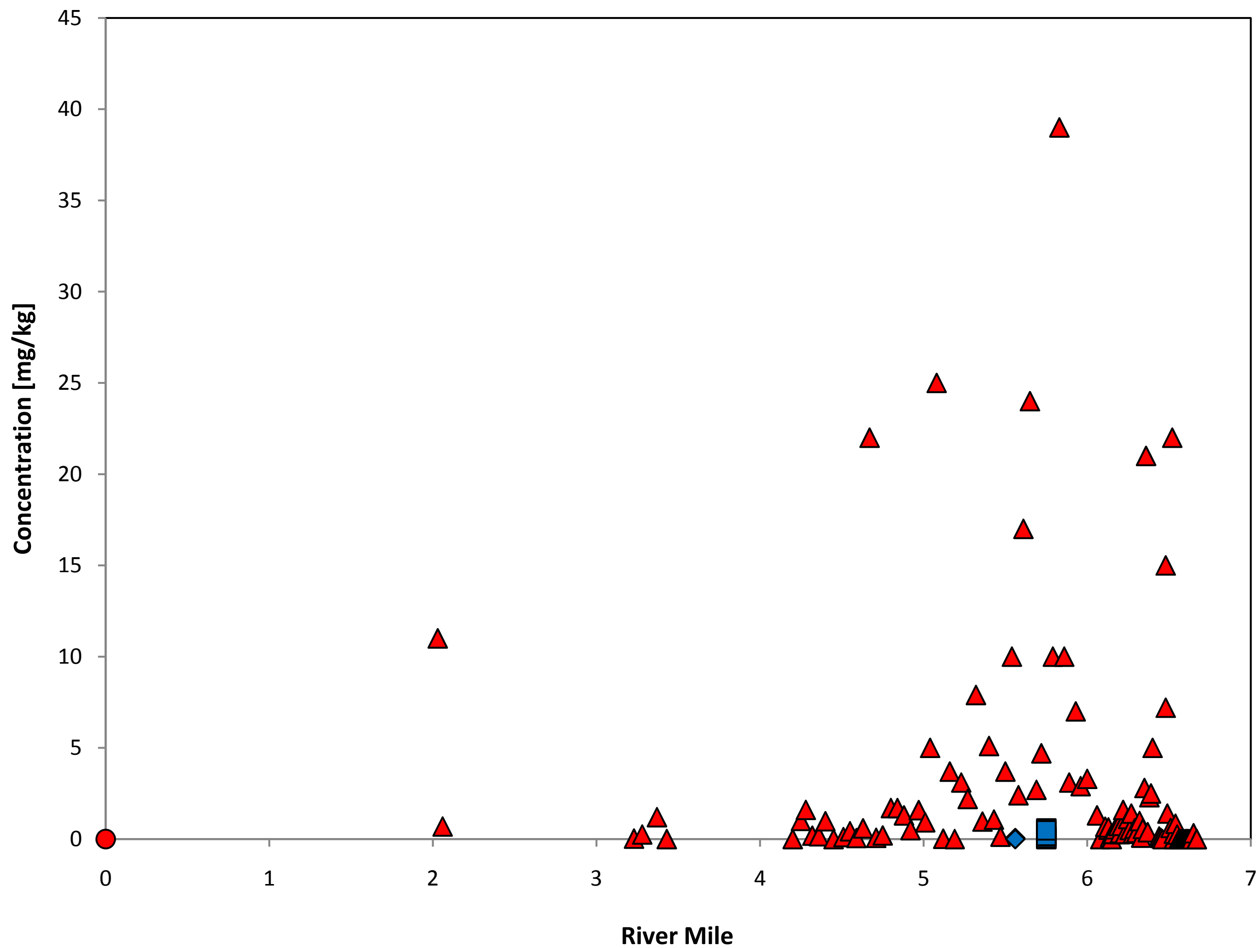
Symbols Legend

- Bound Brook
- Green Brook
- Cedar brook

Notes:

1. Samples collected in Cedar Brook were plotted at River Mile 5.75.
2. Samples collected in Green Brook were plotted at River Mile 0.
3. mg/kg = milligrams/kilogram

MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	**Surface Sediment:** **Total Zinc Concentration vs River Mile** *OU4 Remedial Investigation/Feasibility Study*	July 2010 Figure 3-5e



Colors Legend

- 1997- Bound Brook
- 1997- Green Brook
- 1997- Cedar Brook
- 1999- Cedar Brook
- 1999- Unnamed Tributaries
- 2007- Bound Brook

Symbols Legend

- Bound Brook
- Cedar brook
- Green Brook
- Unnamed Tributaries

Notes:

1. 2007 Bound Brook Sample (not shown) at River Mile 6.54 had a PCB concentration of 190 mg/kg.
2. Lowest Effects Level (LEL) for Total PCB is 0.07 mg/kg (New Jersey Department of Environmental Protection, 1998).
3. Severe Effects Level (SEL) for Total PCB is 530 mg/kg (New Jersey Department of Environmental Protection, 1998).
4. PCB = Polychlorinated Biphenyls
5. mg/kg = milligrams/kilogram

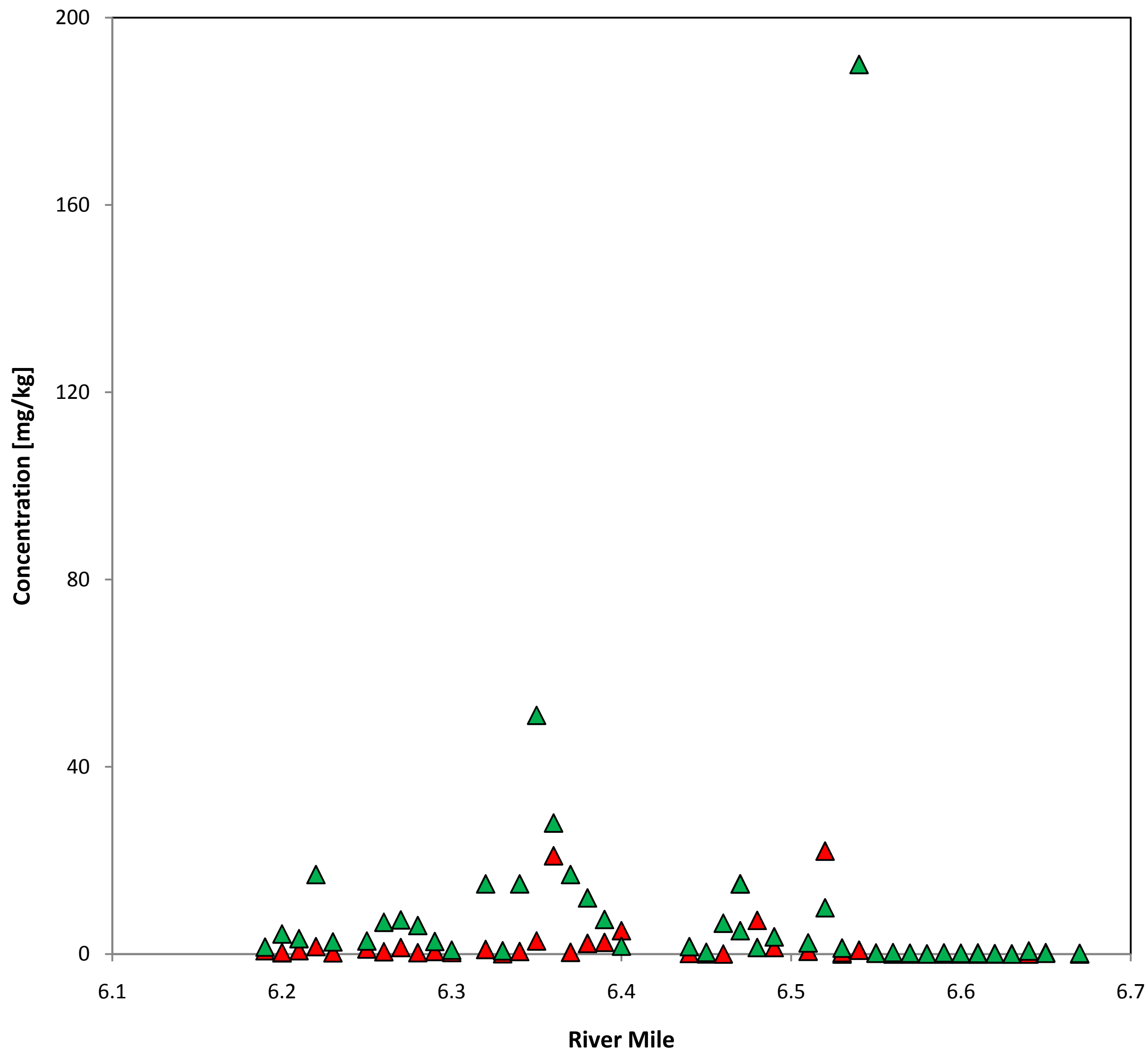
MALCOLM PIRNIE

Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Surface Sediment:
Total PCB Concentration vs River Mile
OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 3-6



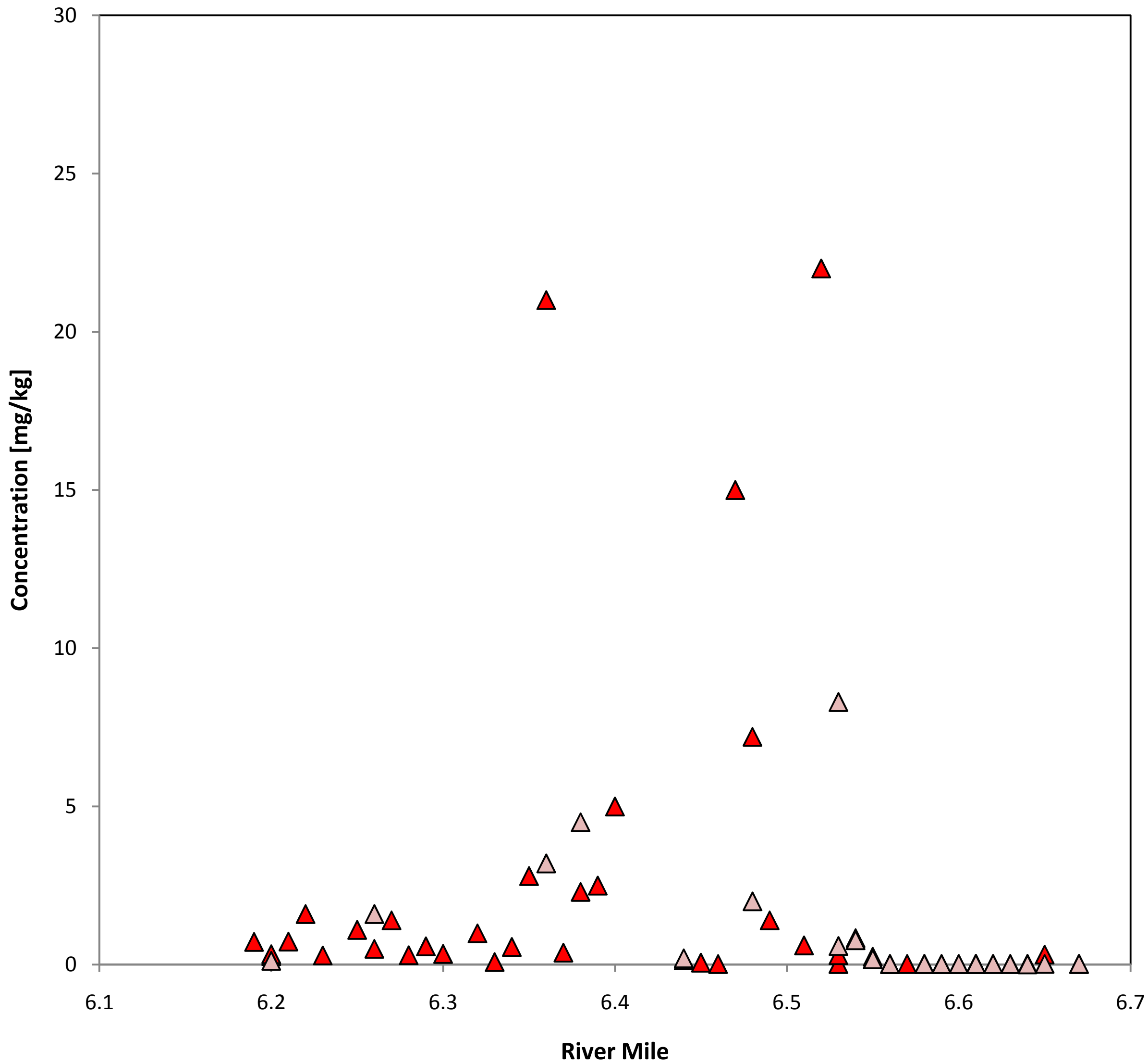
Legend

- 1997- Bound Brook
- 2007- Bound Brook

Notes:

1. mg/kg = milligrams/kilogram

MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	**Surface Sediment:** **Aroclor 1254 Concentration vs River Mile** *OU4 Remedial Investigation/Feasibility Study*	July 2010 Figure 3-7



Legend

- ▲ 1997 Surface Sediment- Bound Brook
- △ 1997 Deep Sediment- Bound Brook

Notes:

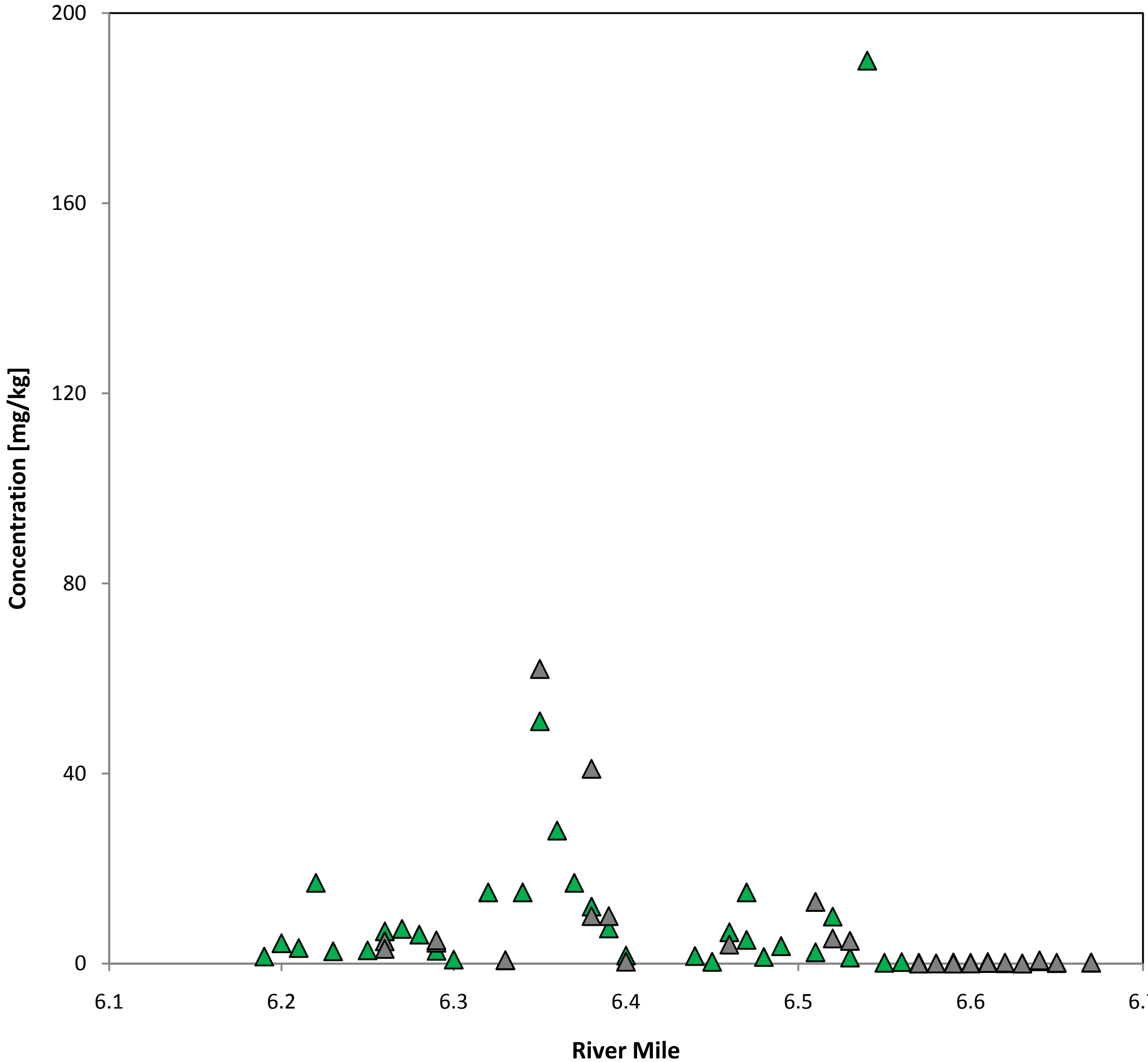
1. mg/kg = milligrams/kilogram

Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Surface and Deep Sediment:
Aroclor 1254 Concentration vs River Mile
OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 3-8



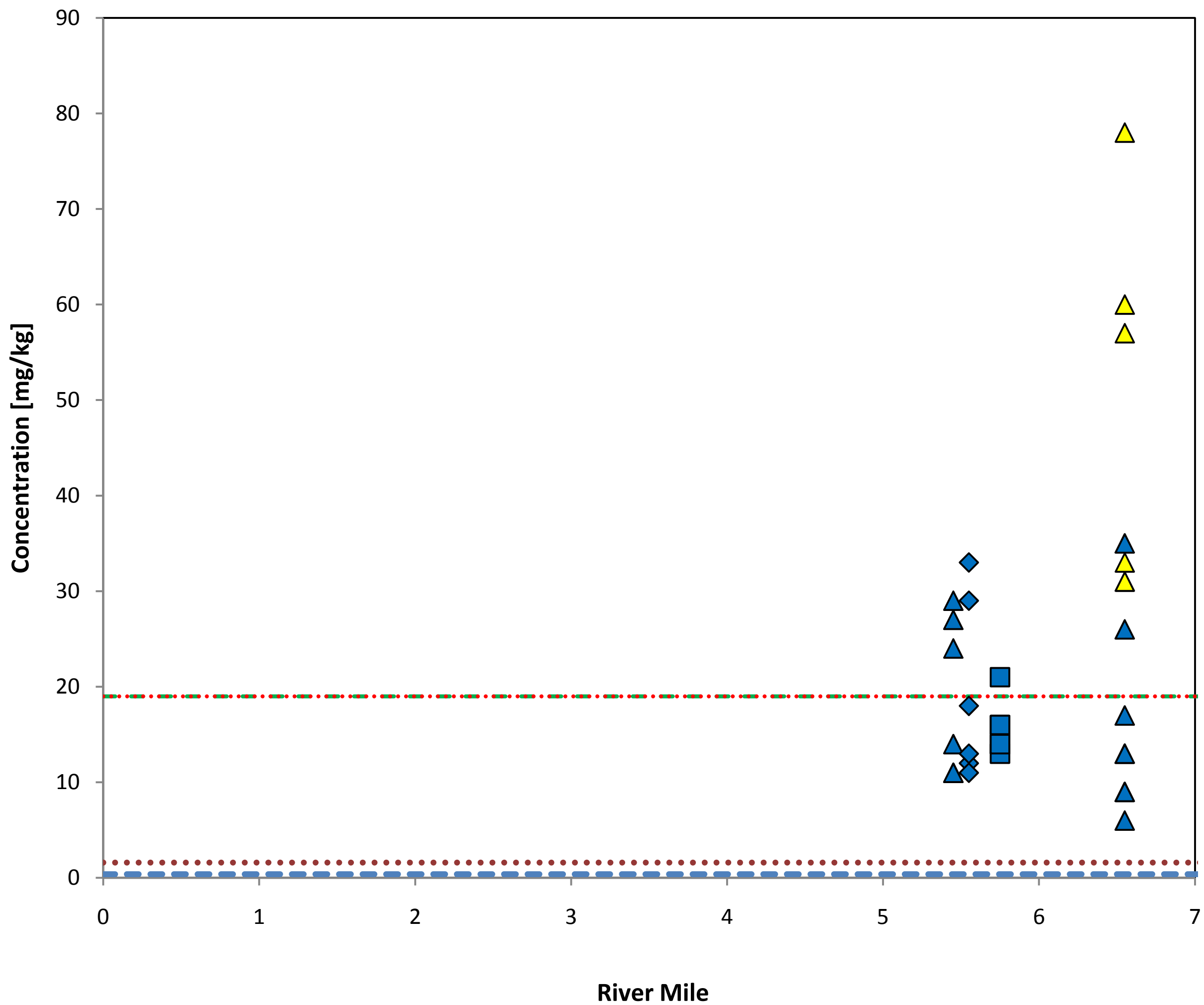
Legend

- 2007 Surface Sediment- Bound Brook
- 2007 Deep Sediment- Bound Brook

Notes:

1. mg/kg = milligrams/kilogram

MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	**Surface and Deep Sediment:** **Aroclor 1254 Concentration vs River Mile** *OU4 Remedial Investigation/Feasibility Study*	July 2010 Figure 3-9



Colors Legend

- 1999 - Bound Brook
- 1999 - Cedar Brook
- 1999 – Unnamed tributary
- 2000- Bound Brook
- NJDEP SRS, Residential Direct Contact
- NJDEP SRS, Non-residential Direct Contact
- USEPA RSL (Residential Soil)
- USEPA RSL (Industrial Soil)

Symbols Legend

- Bound Brook
- Cedar Brook
- Green Brook
- Unnamed Tributaries

Notes:

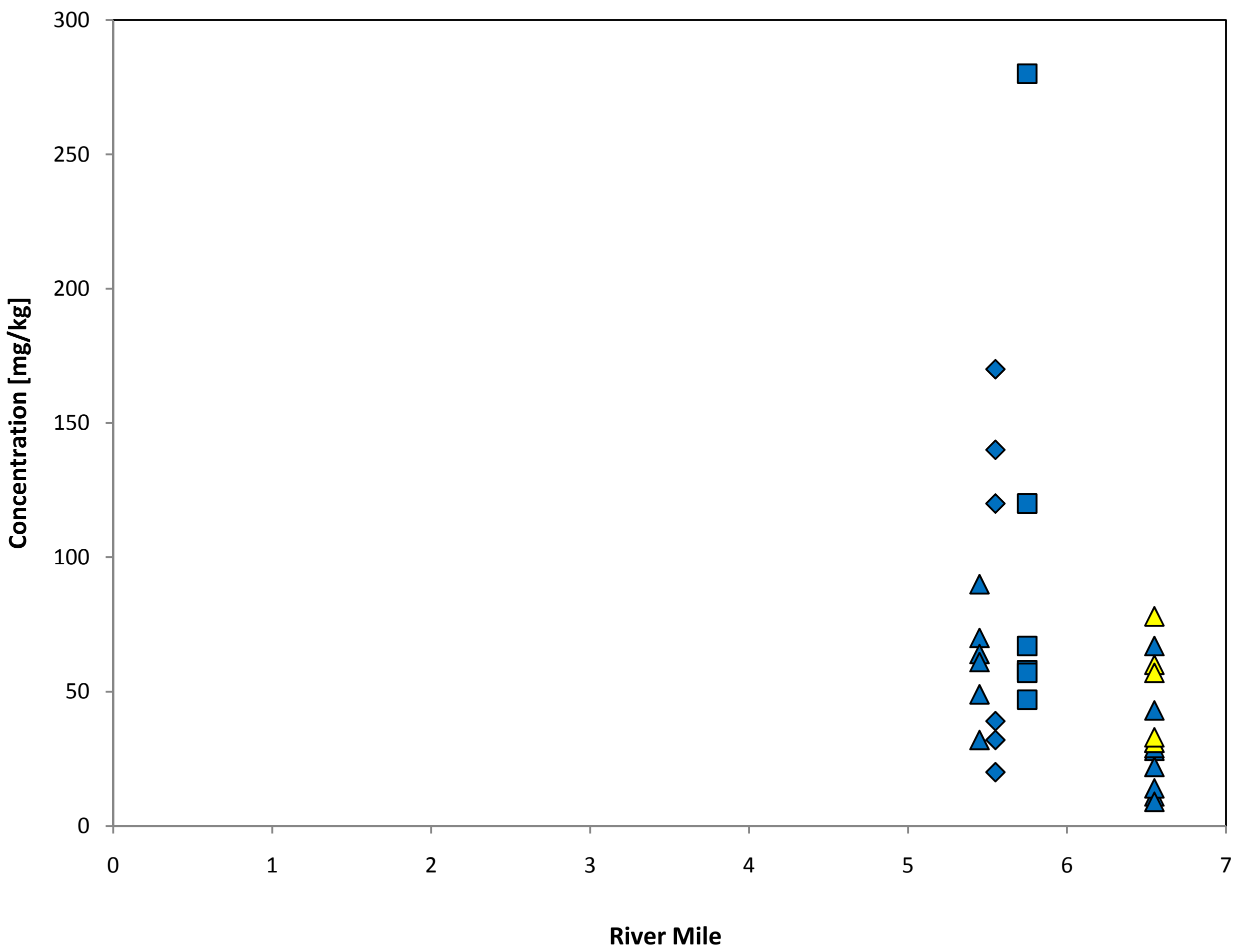
1. Both NJDEP Soil Remediation Standards (SRS), Residential and Non-residential criteria for arsenic are 19 mg/kg (NJDEP , 2009).
2. USEPA Regional Screening Level [RSL (Residential Soil)] for arsenic is 0.39 mg/kg (USEPA , 2010).
3. USEPA RSL (Industrial Soil) for arsenic is 1.6 mg/kg (USEPA , 2010).
4. The NJDEP SRS for arsenic is based on natural background.
5. mg/kg = milligrams/kilogram
6. Area 1 plots as a Bound Brook symbol at River Mile 6.55.

   Area 2 plots as a Cedar Brook symbol at River Mile 5.75.

   Area 3 plots as a Bound Brook symbol at River Mile 5.45.

   Area 4 plots as an unnamed tributary symbol at River Mile 5.55.

MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	**Surface Soil:** **Total Arsenic Concentration vs River Mile** *OU4 Remedial Investigation/Feasibility Study*	July 2010 Figure 3-10a



Colors Legend

- 1999 - Bound Brook
- 1999 - Cedar Brook
- 1999 – Unnamed tributary
- 2000- Bound Brook

Symbols Legend

- Bound Brook
- Cedar brook
- Green Brook
- Unnamed Tributaries

Notes:

1. NJDEP SRS, Residential Direct Contact Criteria and USEPA RSL (Residential Soil) for chromium is 120,000 mg/kg (NJDEP, 2010 and USEPA, 2010).
2. NJDEP SRS, Non-residential Direct Contact Criteria for chromium is not regulated (NJDEP, 2010) and USEPA RSL (Industrial Soil) is 1,500,000 mg/kg (USEPA, 2010).
3. The values for chromium are for the trivalent form.
4. The USEPA Regional Screening Level (Residential and Industrial Soil) is at or exceeds the theoretical ceiling limit of 10^{+5} mg/kg which is equivalent to a chemical representing 10% by weight of the soil sample. At this contaminant concentration (and higher), the assumptions for soil contact may be violated (for example, soil adherence and wind-borne dispersion assumptions) due to the presence of the foreign substance itself.
5. mg/kg = milligrams/kilogram
6. Area 1 plots as a Bound Brook symbol at River Mile 6.55.

   Area 2 plots as a Cedar Brook symbol at River Mile 5.75.

   Area 3 plots as a Bound Brook symbol at River Mile 5.45.

   Area 4 plots as an unnamed tributary symbol at River Mile 5.55.

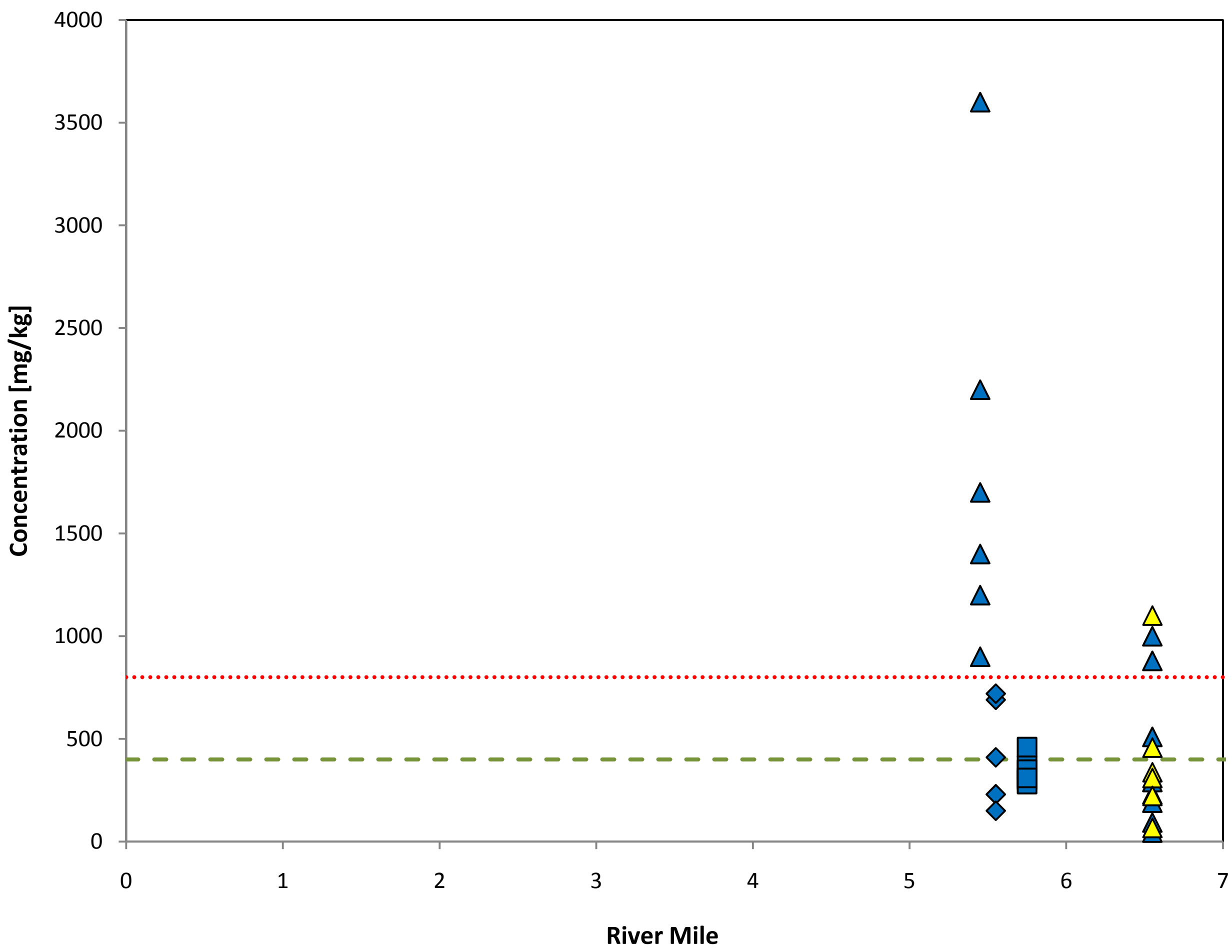
MALCOLM PIRNIE

Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Surface Soil:
Total Chromium Concentration vs River Mile
OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 3-10b



Colors Legend

- 1999 - Bound Brook
- 1999 - Cedar Brook
- 1999 – Unnamed tributary
- 2000- Bound Brook
- NJDEP SRS, Residential Direct Contact Criteria and USEPA RSL (Residential Soil)
- NJDEP SRS, Non-residential Direct Contact Criteria and USEPA RSL (Industrial Soil)

Symbols Legend

- Bound Brook
- Cedar brook
- Green Brook
- Unnamed Tributaries

Notes:

1. NJDEP SRS, Residential Direct Contact Criteria and USEPA RSL (Residential Soil) for total lead is 400 mg/kg (NJDEP, 2009 and USEPA, 2010).
2. NJDEP SRS, Non-residential Direct Contact Criteria and USEPA RSL (Industrial Soil) for total lead is 800 mg/kg (NJDEP, 2009 and USEPA, 2010).
3. 1999 Bound Brook samples at RM4.55 (not shown) had a PCB concentration of 3,600 mg/kg.
4. mg/kg = milligrams/kilogram
5. Area 1 plots as a Bound Brook symbol at River Mile 6.55.

   Area 2 plots as a Cedar Brook symbol at River Mile 5.75.

   Area 3 plots as a Bound Brook symbol at River Mile 5.45.

   Area 4 plots as an unnamed tributary symbol at River Mile 5.55.

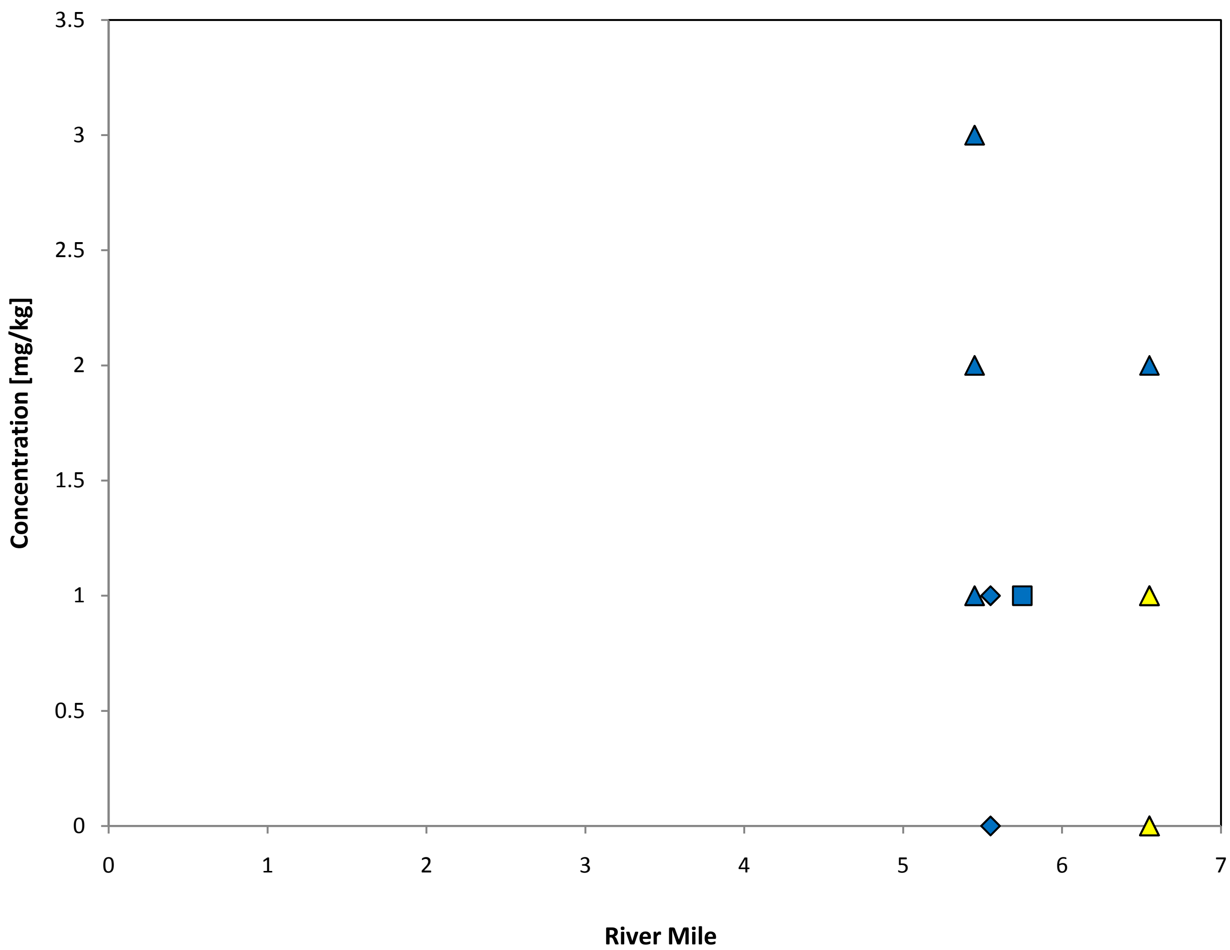
MALCOLM PIRNIE

Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Surface Soil:
Total Lead Concentration vs River Mile
OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 3-10c



Colors Legend

- 1999 - Bound Brook
- 1999 - Cedar Brook
- 1999 – Unnamed tributary
- 2000- Bound Brook

Symbols Legend

- Bound Brook
- Cedar brook
- Green Brook
- Unnamed Tributaries

Notes:

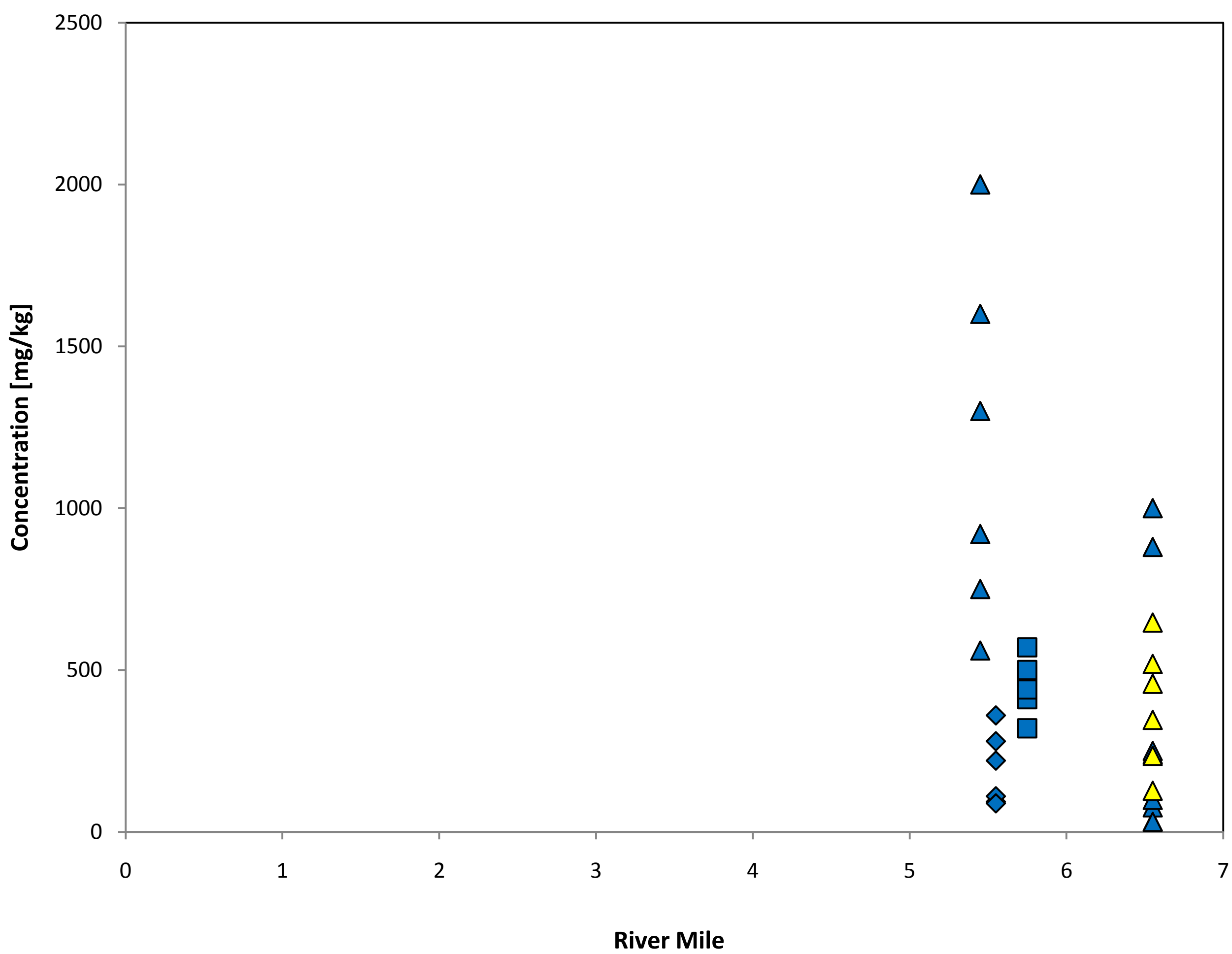
1. NJDEP SRS, Residential Direct Contact Criteria and USEPA RSL (Residential Soil) for mercury is 23 mg/kg (NJDEP, 2009 and USEPA, 2010).
2. NJDEP SRS, Non-residential Direct Contact Criteria for mercury is 65 mg/kg (NJDEP, 2009) and USEPA RSL (Industrial Soil) is 310 mg/kg (USEPA, 2010).
3. mg/kg = milligrams/kilogram
4. Area 1 plots as a Bound Brook symbol at River Mile 6.55.

   Area 2 plots as a Cedar Brook symbol at River Mile 5.75.

   Area 3 plots as a Bound Brook symbol at River Mile 5.45.

   Area 4 plots as an unnamed tributary symbol at River Mile 5.55.

MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	**Surface Soil:** **Total Mercury Concentration vs River Mile** *OU4 Remedial Investigation/Feasibility Study*	July 2010 Figure 3-10d



Colors Legend

- 1999 - Bound Brook
- 1999 - Cedar Brook
- 1999 – Unnamed tributary
- 2000- Bound Brook

Symbols Legend

- Bound Brook
- Cedar brook
- Green Brook
- Unnamed Tributaries

Notes:

1. NJDEP SRS, Residential Direct Contact Criteria and USEPA RSL (Residential Soil) for zinc is 23,000 mg/kg (NJDEP, 2009 and USEPA, 2010).
2. NJDEP SRS, Non-residential Direct Contact Criteria for zinc is 110,000 mg/kg (NJDEP, 2009) and USEPA RSL (Industrial Soil) is 310,000 mg/kg (USEPA, 2010).
3. mg/kg = milligrams/kilogram
4. Area 1 plots as a Bound Brook symbol at River Mile 6.55.

   Area 2 plots as a Cedar Brook symbol at River Mile 5.75.

   Area 3 plots as a Bound Brook symbol at River Mile 5.45.

   Area 4 plots as an unnamed tributary symbol at River Mile 5.55.

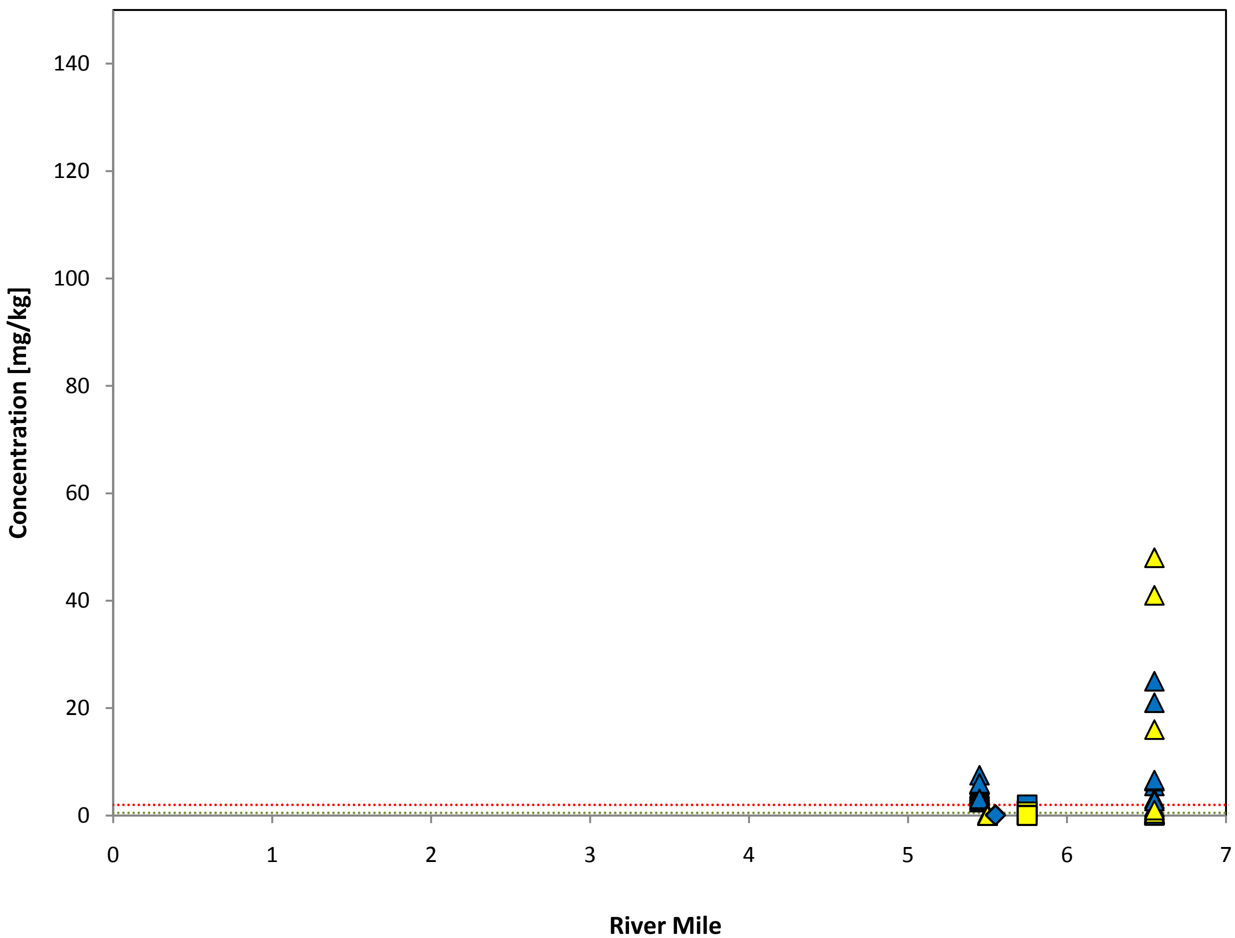
MALCOLM PIRNIE

Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Surface Soil:
Total Zinc Concentration vs River Mile
OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 3-10e



Colors Legend

- 1999- Bound Brook
- 2000 – Bound Brook
- 1999 – Cedar Brook
- 2000 - Cedar Brook
- 1999 – Unnamed tributary
- NJDEP SRS, Residential Direct Contact
- NJDEP SRS, Non-residential Direct Contact Criteria

Symbols Legend

- Bound Brook
- Cedar brook
- Green Brook
- Unnamed Tributaries

Notes:

1. NJDEP SRS, Residential Direct Contact Criteria for PCB is 0.2 mg/kg (NJDEP, 2009).
2. NJDEP SRS, Non-residential Direct Contact Criteria for PCB is 1 mg/kg (NJDEP, 2009).
3. PCB = Polychlorinated Biphenyls
4. mg/kg = milligrams/kilogram
5. Two data points are not shown: 1997 Bound Brook at River Mile 6.34 (830 mg/kg); 2000 Bound Brook at River Mile 6.55 (19,000 mg/kg).
6. Area 1 plots as a Bound Brook symbol at River Mile 6.55. Area 2 plots as a Cedar Brook symbol at River Mile 5.75. Area 3 plots as a Bound Brook symbol at River Mile 5.45. Area 4 plots as an unnamed tributary symbol at River Mile 5.55.

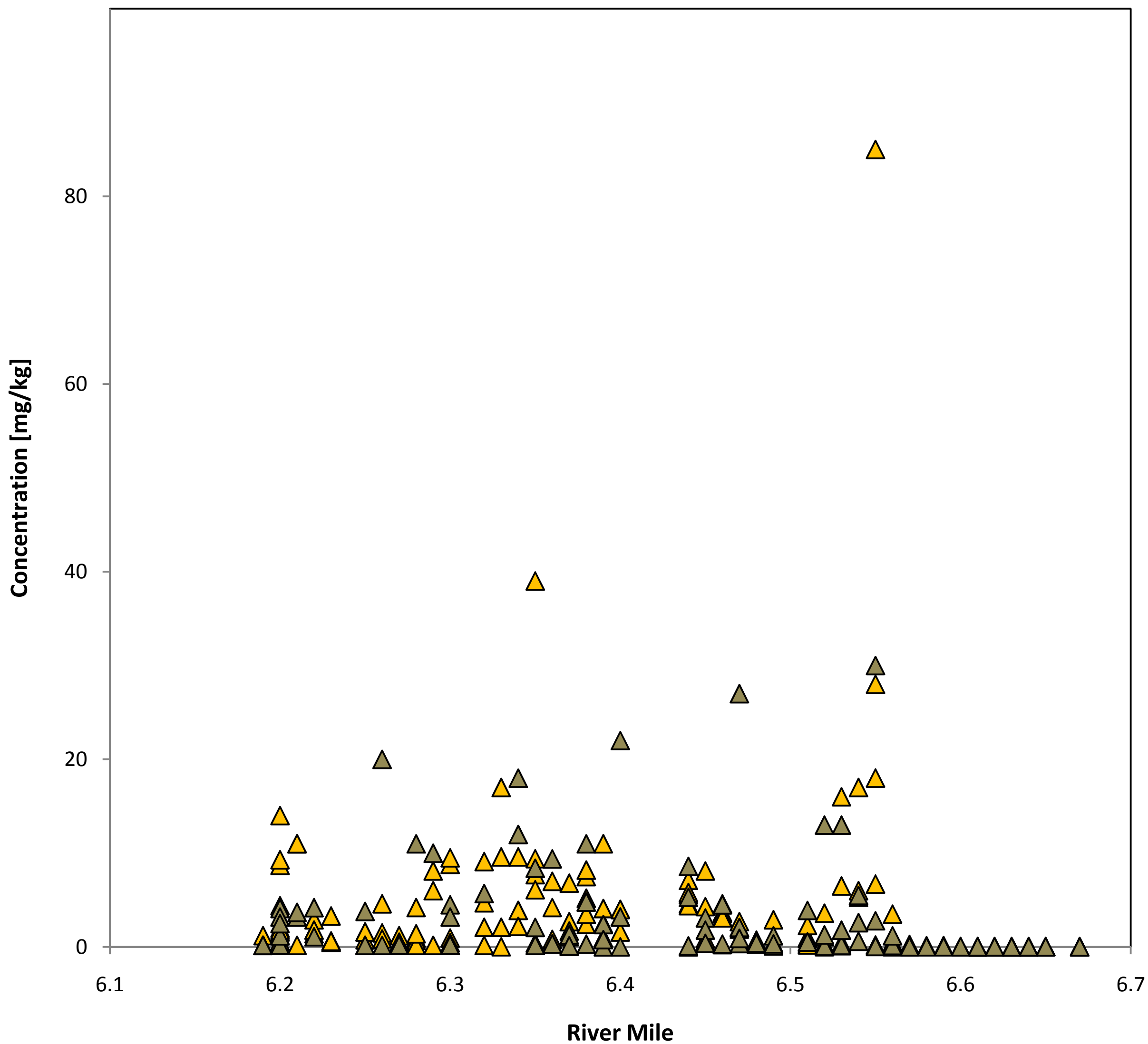
MALCOLM PIRNIE

Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Surface Soil:
Total PCB Concentration vs River Mile
OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 3-11



Legend

- 1997 Surface Bank Soils- Bound Brook
- 1997 Deep Bank Soils – Bound Brook

Notes:

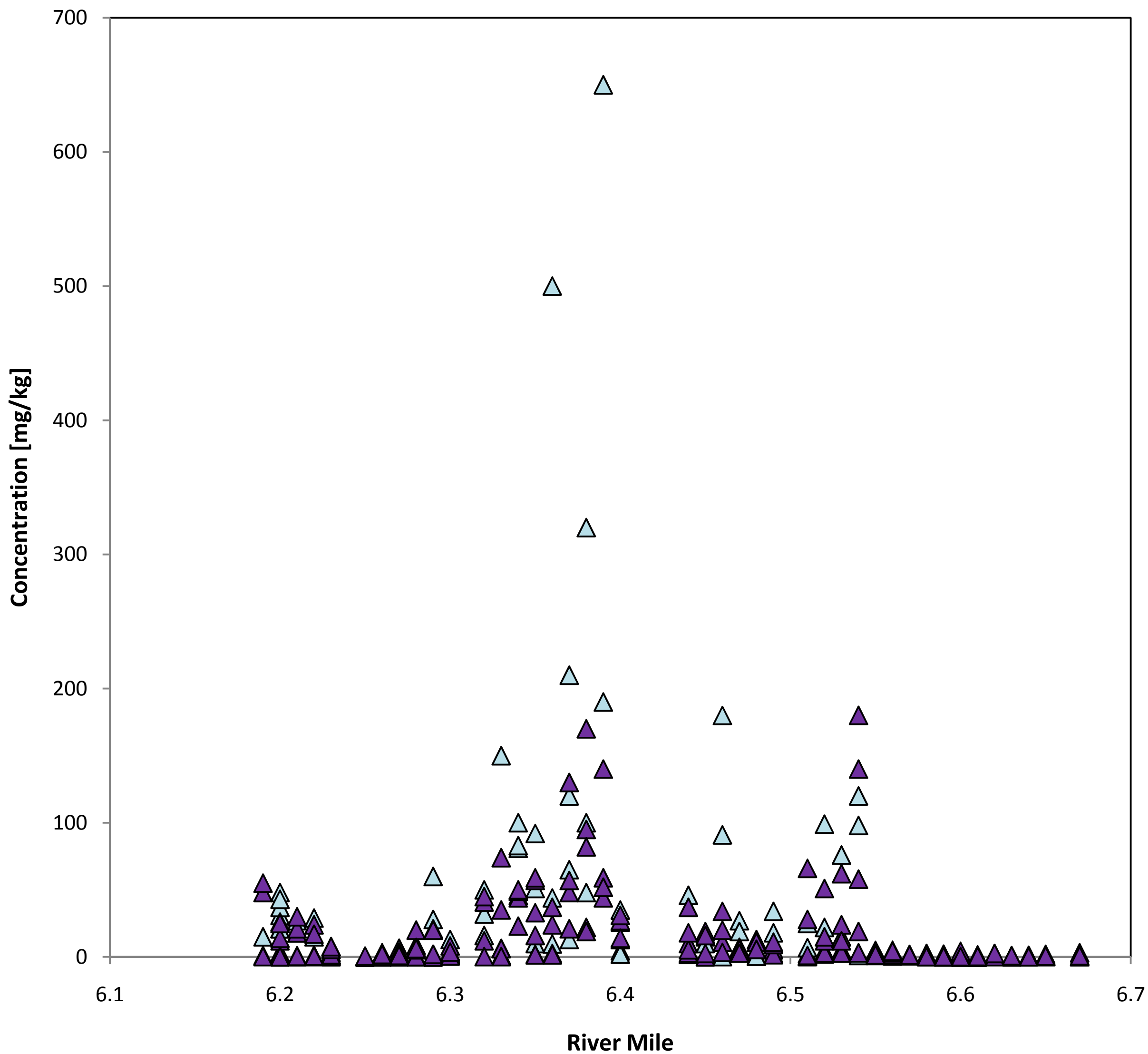
1. mg/kg = milligrams/kilogram

Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Surface and Deep Bank Soil:
Aroclor 1254 Concentration vs River Mile
OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 3-12



Legend

- ▲ 2007 Surface Bank Soils-Bound Brook
- △ 2007 Deep Bank Soils – Bound Brook

Notes:

1. mg/kg = milligrams/kilogram

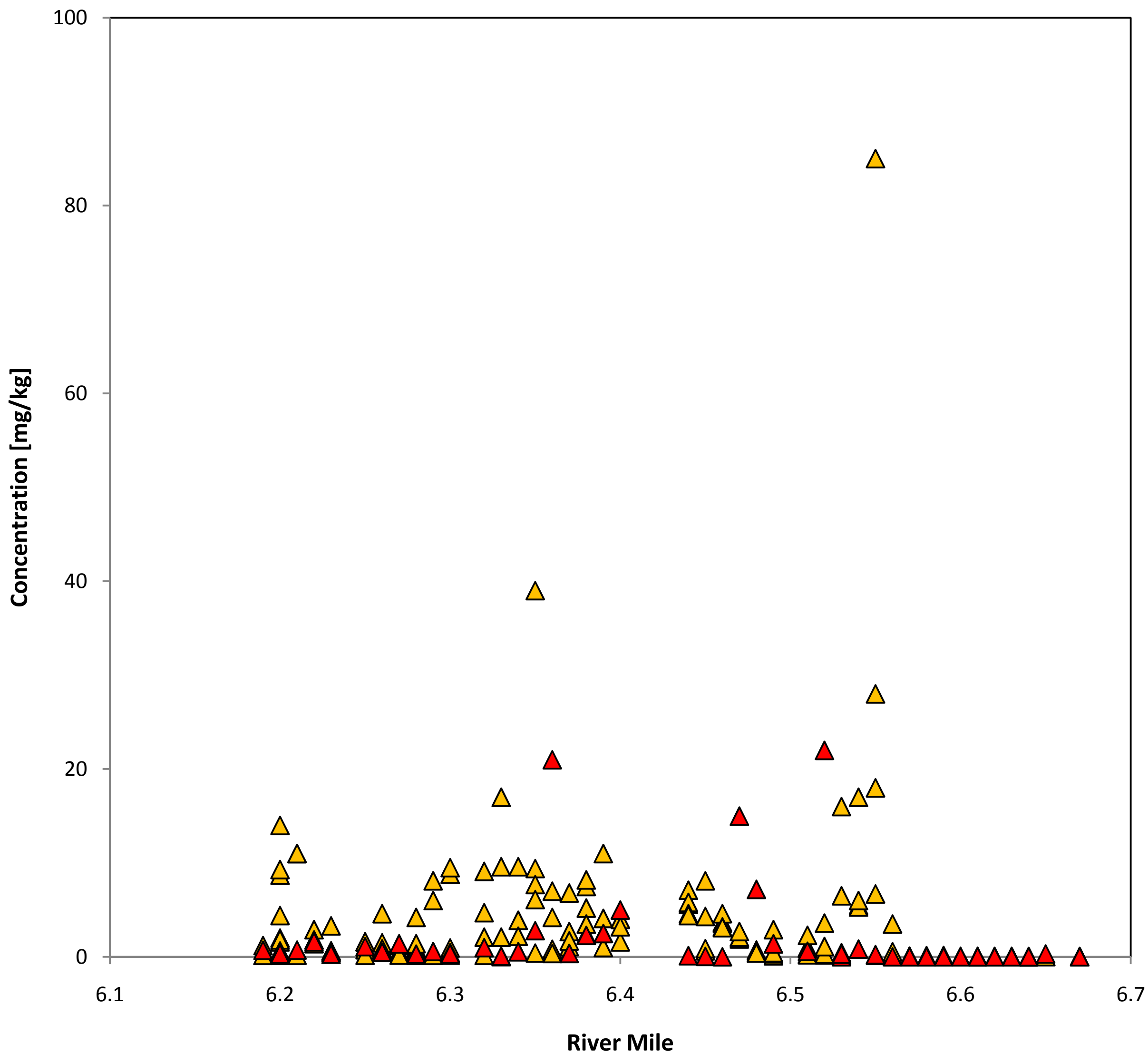
MALCOLM PIRNIE

Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Surface and Deep Bank Soil:
Aroclor 1254 Concentration vs River Mile
OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 3-13



Legend

- 1997 Surface Bank Soils-Bound Brook
- 1997 Surface Sediment – Bound Brook

Notes:

1. mg/kg = milligrams/kilogram

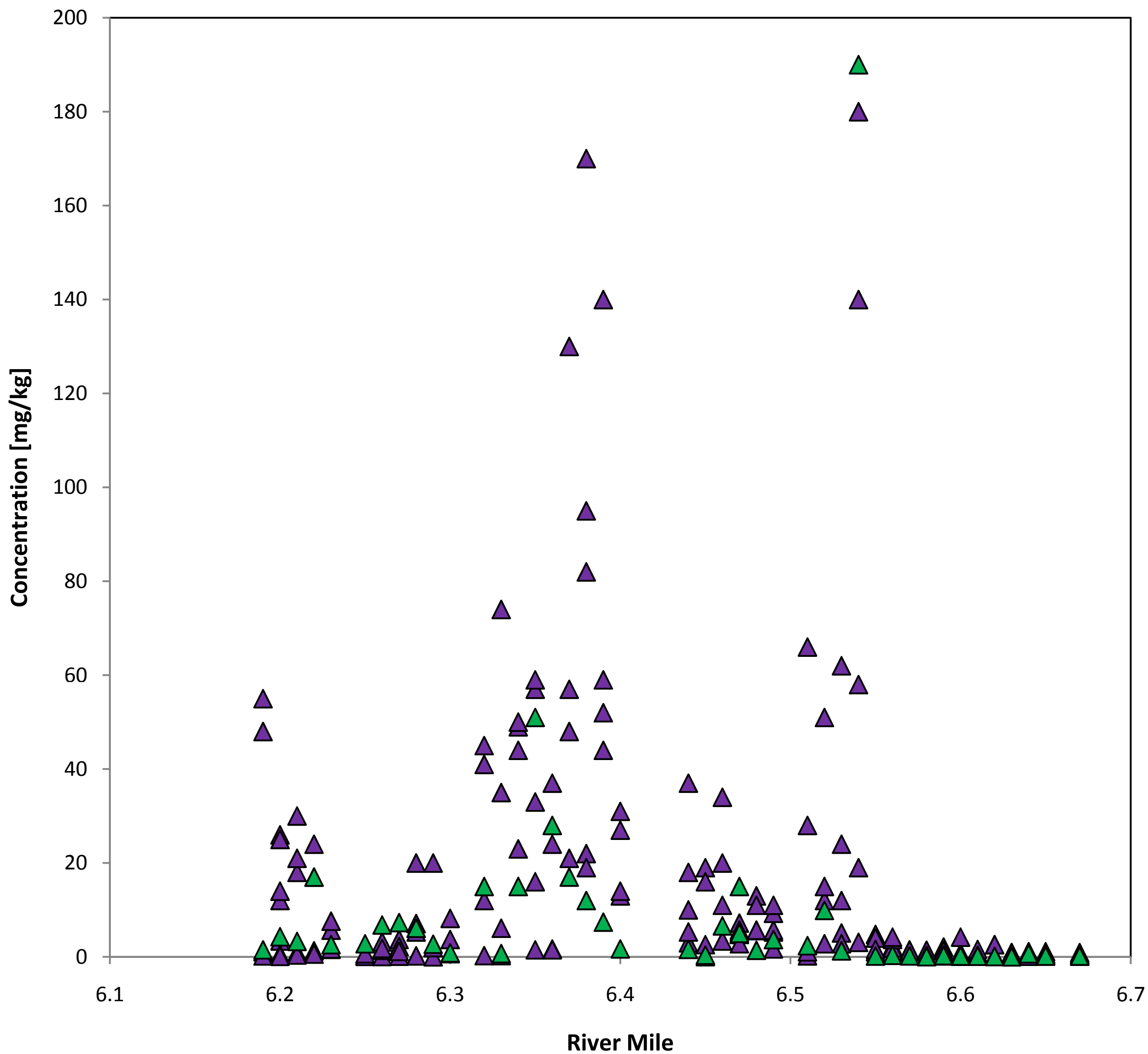
MALCOLM PIRNIE

Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Surface Sediment and Bank Soil:
Aroclor 1254 Concentration vs River Mile
OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 3-14



Legend

2007 Surface Bank Soils- Bound Brook

2007 Surface Sediment – Bound Brook

Notes:

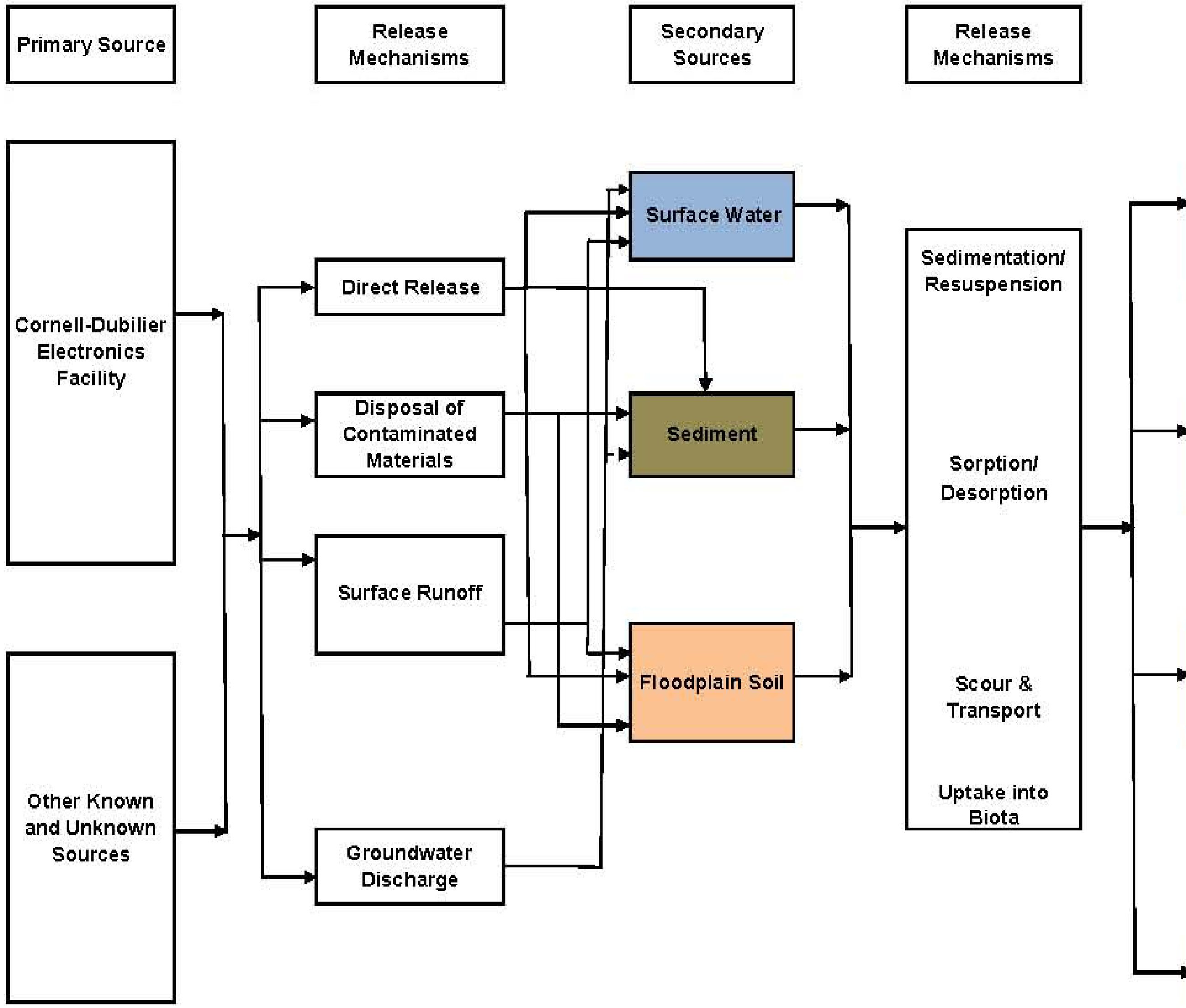
1. mg/kg = milligrams/kilogram

Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Surface Sediment and Bank Soil:
Aroclor 1254 Concentration vs River Mile
OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 3-15



		POTENTIAL ECOLOGICAL RECEPTORS									
Exposure Media	Exposure Routes	Aquatic Plants	Benthic Invertebrates	Freshwater Fish	Semi-Aquatic Birds	Semi-Aquatic Mammals	Reptiles/ Amphibians	Terrestrial Plants	Terrestrial Invertebrates	Terrestrial Birds	Terrestrial Mammals
Surface Water	Ingestion				●	●	●			●	●
	Dermal Contact			●	●	●	●				
	Respiration			●			●				
	Uptake	●		●							
Sediment	Ingestion		●		●	●	●				
	Dermal Contact				●	●	●				
	Uptake		●								
Floodplain Soil	Ingestion						●		●	●	●
	Dermal Contact						●			●	●
	Uptake/Contact							●	●		
Biota	Ingestion		●	●	●	●	●		●	●	●

LEGEND:
● = Potentially Complete Exposure Pathway
→ = Release Mechanism

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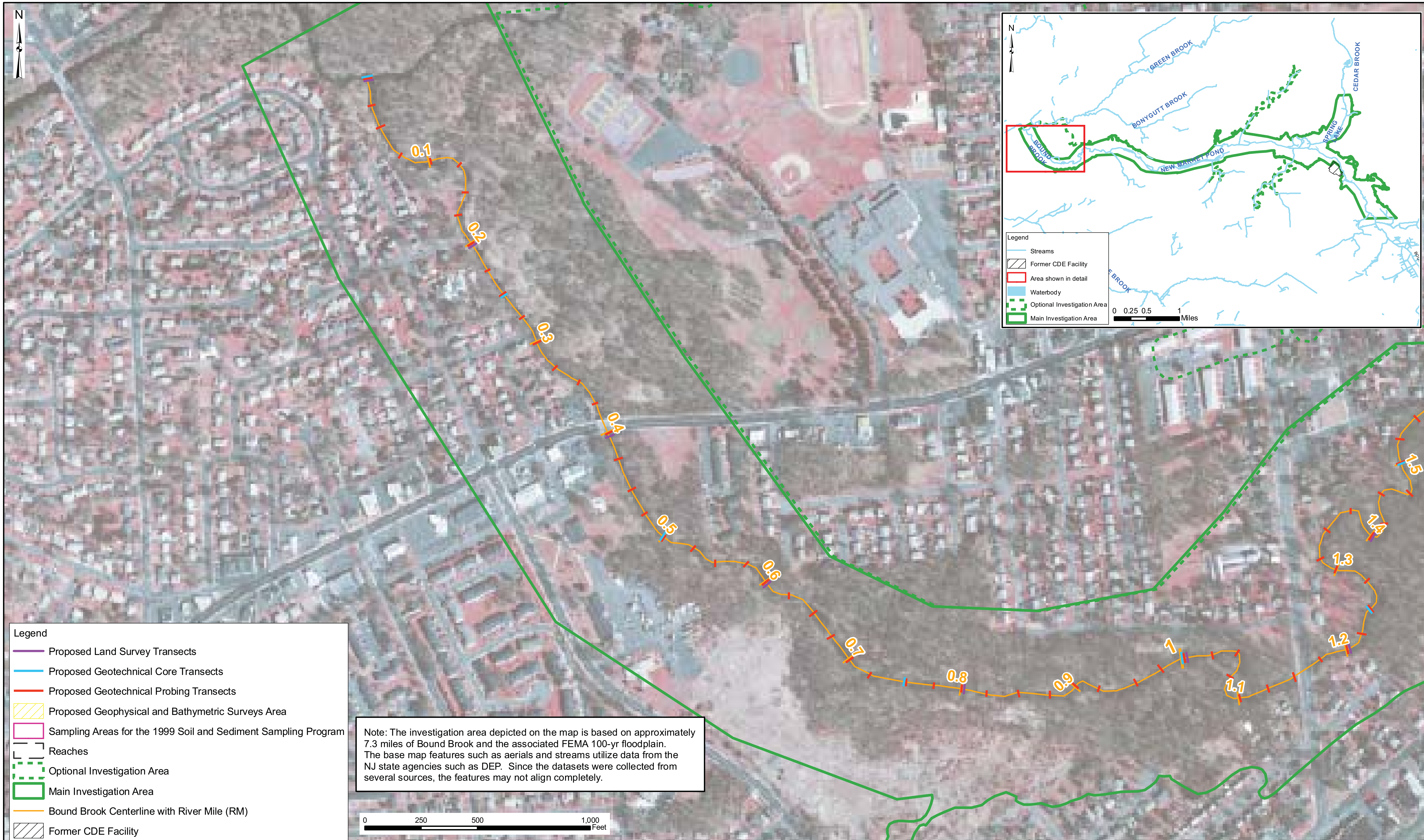
Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Preliminary Ecological Conceptual Site Exposure Model

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 3-16



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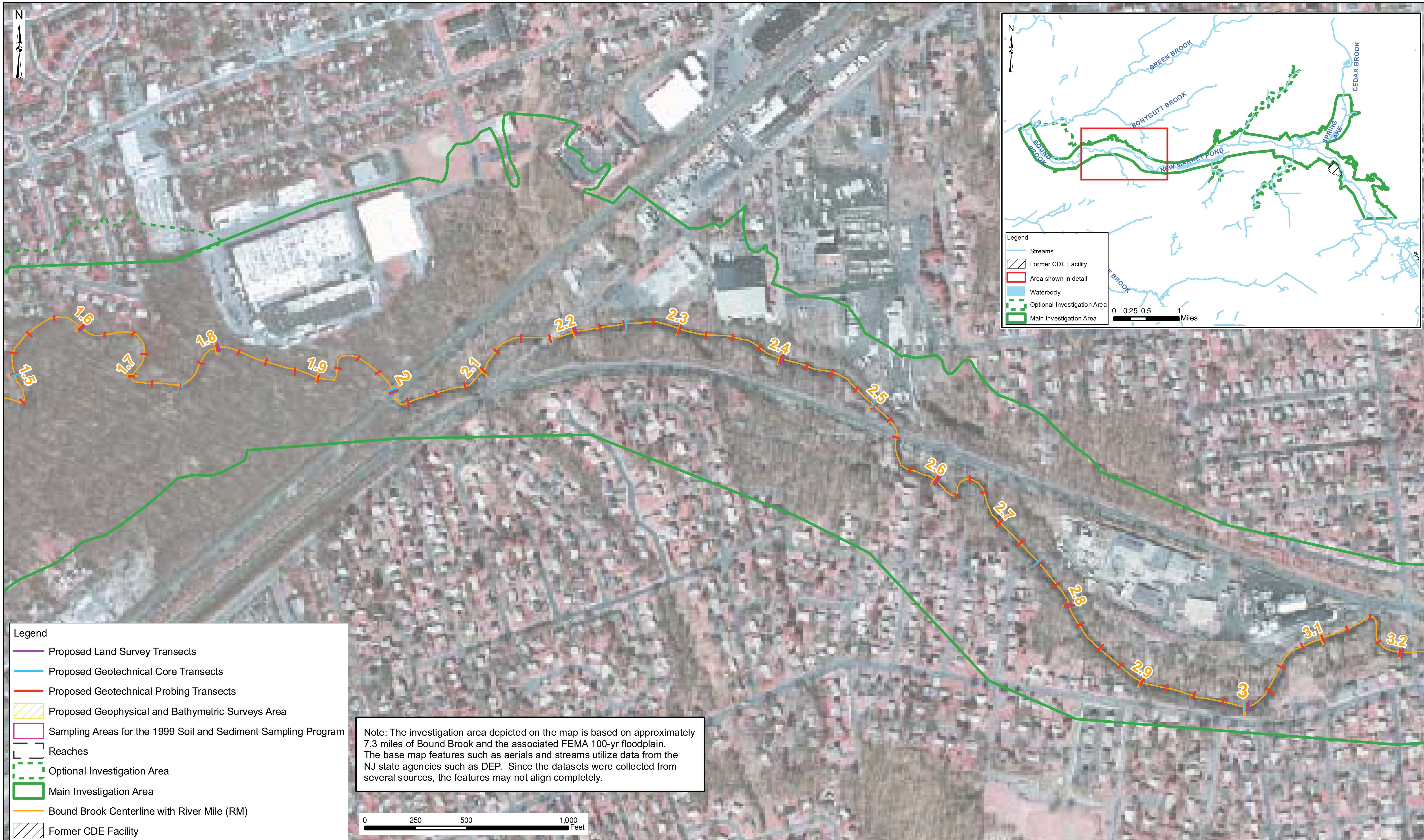
Superfund Site
South Plainfield, New Jersey

Proposed Geophysical and Geotechnical Survey Transect Locations

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 5-3a



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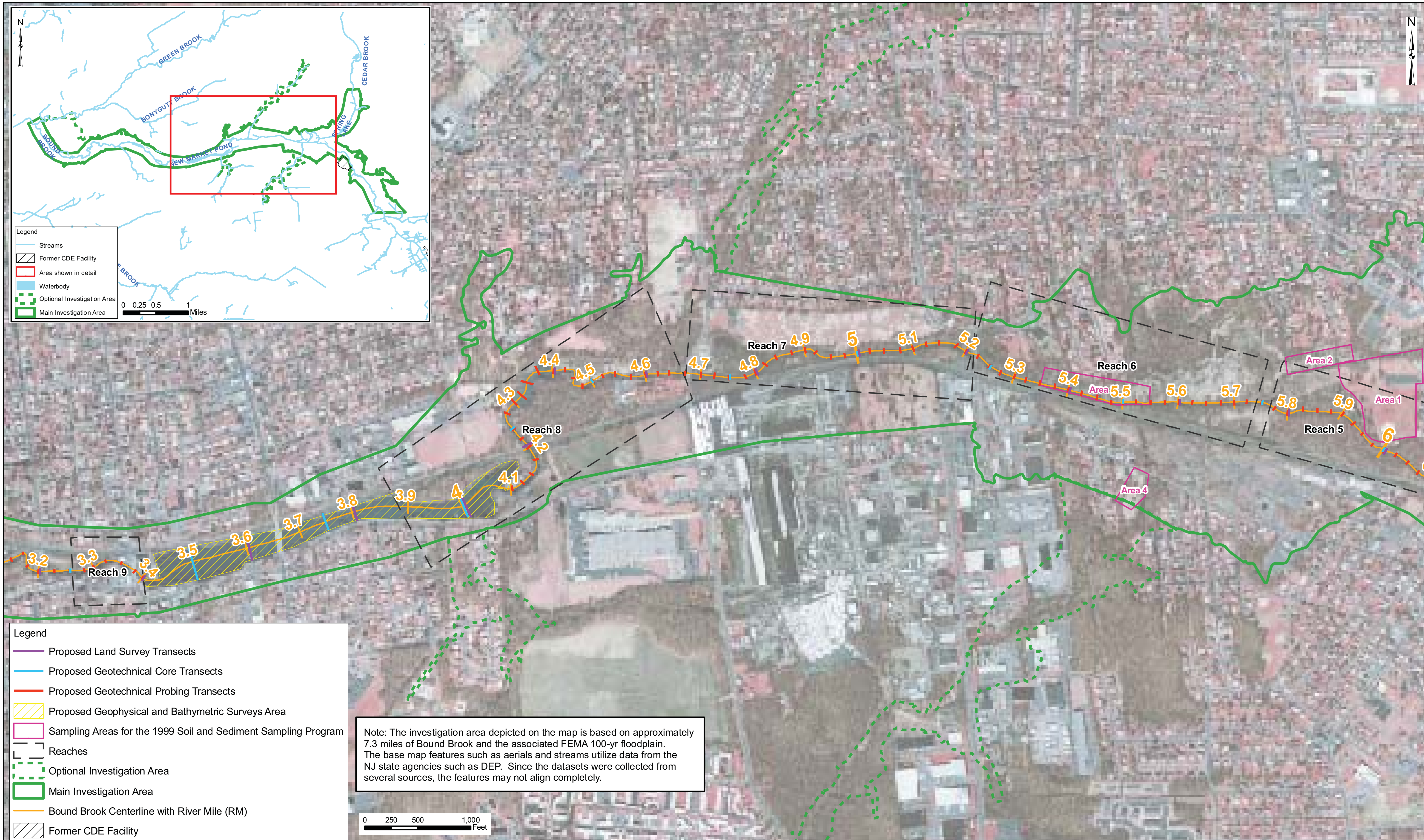
Superfund Site
South Plainfield, New Jersey

Proposed Geophysical and Geotechnical Survey Transect Locations

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 5-3b



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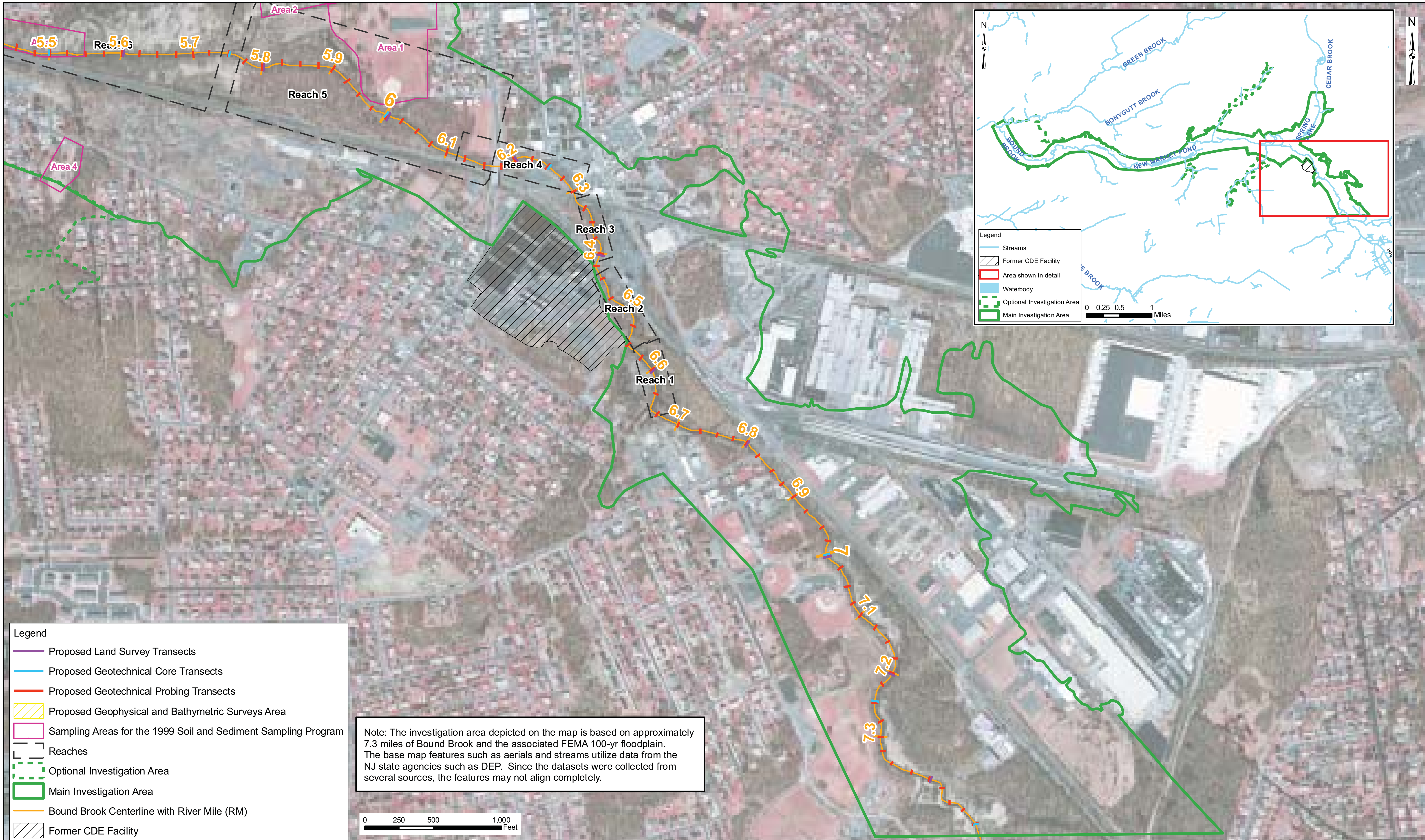
Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Proposed Geophysical and Geotechnical Survey Transect Locations

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 5-3c



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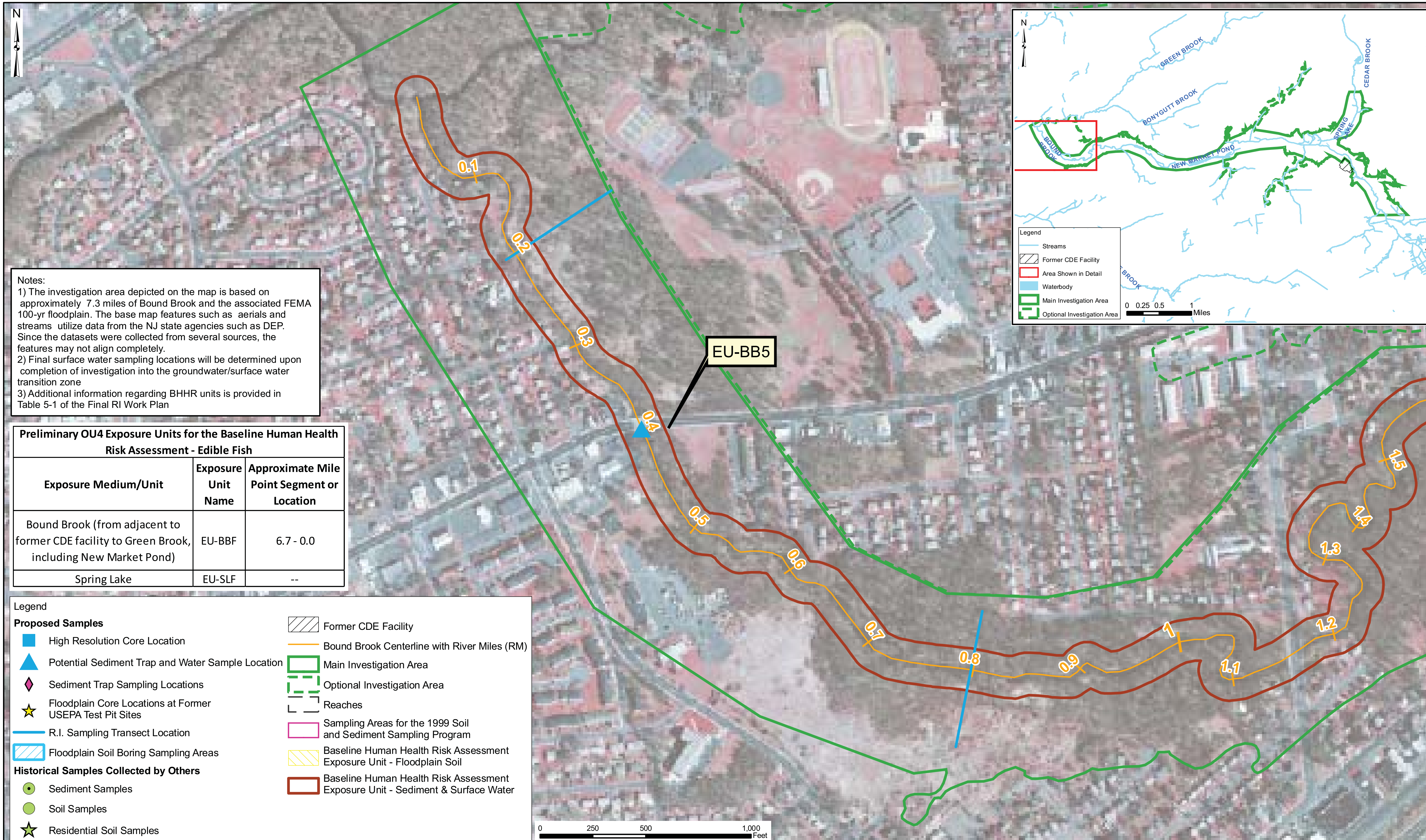
Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Proposed Geophysical and Geotechnical Survey Transect Locations

OU4 Remedial Investigation/Feasibility Study

July 2010

Figure 5-3d



Notes:
1) The investigation area depicted on the map is based on approximately 7.3 miles of Bound Brook and the associated FEMA 100-yr floodplain. The base map features such as aerials and streams utilize data from the NJ state agencies such as DEP. Since the datasets were collected from several sources, the features may not align completely.
2) Final surface water sampling locations will be determined upon completion of investigation into the groundwater/surface water transition zone
3) Additional information regarding BHHR units is provided in Table 5-1 of the Final RI Work Plan

Preliminary OU4 Exposure Units for the Baseline Human Health Risk Assessment - Edible Fish

Exposure Medium/Unit	Exposure Unit Name	Approximate Mile Point Segment or Location
Bound Brook (from adjacent to former CDE facility to Green Brook, including New Market Pond)	EU-BBF	6.7 - 0.0
Spring Lake	EU-SLF	--

Legend

Proposed Samples
- High Resolution Core Location
- Potential Sediment Trap and Water Sample Location
- Sediment Trap Sampling Locations
- Floodplain Core Locations at Former USEPA Test Pit Sites
- R.I. Sampling Transect Location
- Floodplain Soil Boring Sampling Areas

Historical Samples Collected by Others
- Sediment Samples
- Soil Samples
- Residential Soil Samples

- Former CDE Facility
- Bound Brook Centerline with River Miles (RM)
- Main Investigation Area
- Optional Investigation Area
- Reaches
- Sampling Areas for the 1999 Soil and Sediment Sampling Program
- Baseline Human Health Risk Assessment Exposure Unit - Floodplain Soil
- Baseline Human Health Risk Assessment Exposure Unit - Sediment & Surface Water

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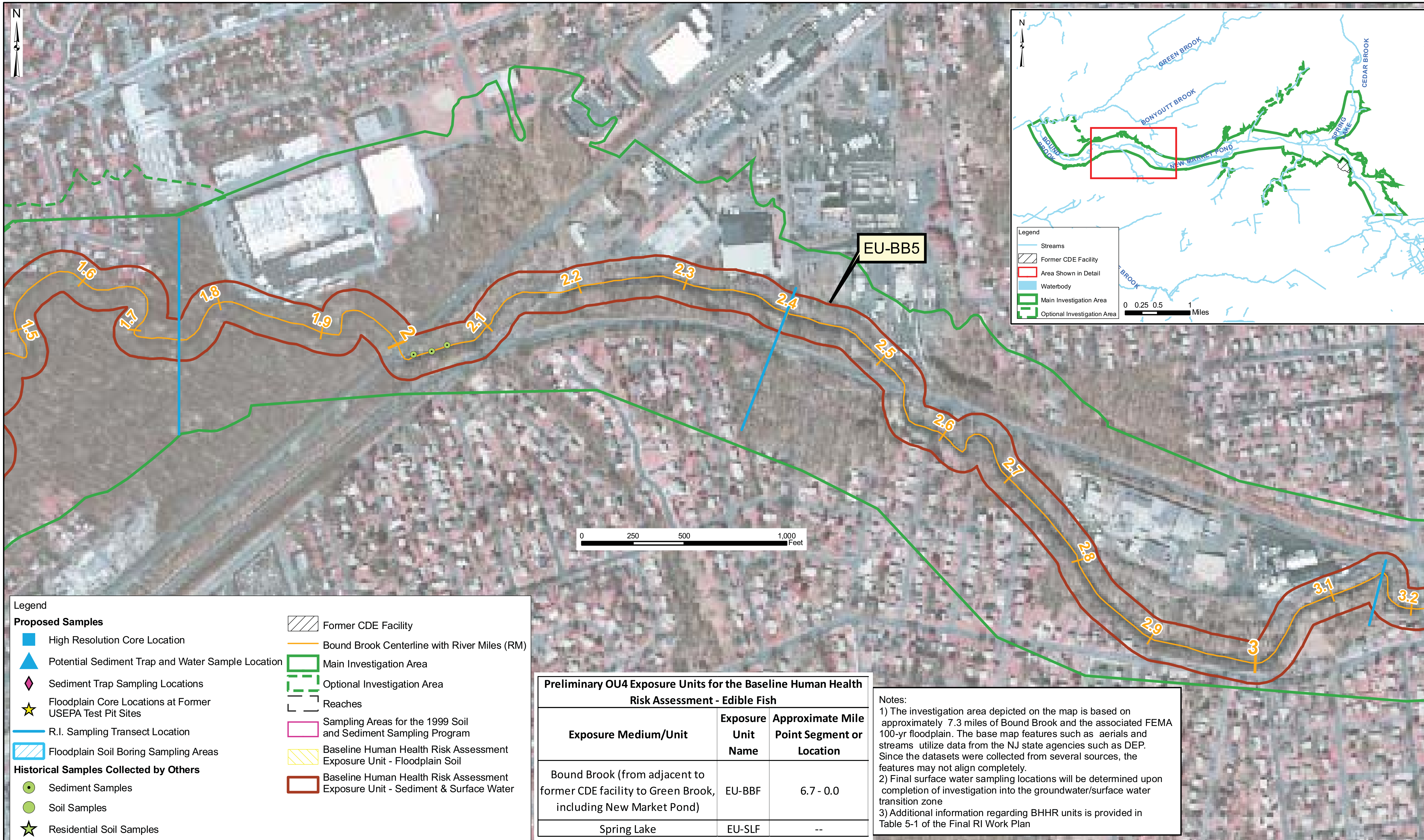
Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Proposed Sediment, Soil, and Surface Water Sampling Locations

OU4 Remedial Investigation/Feasibilty Study

July 2010

Figure 5-3e



Preliminary OU4 Exposure Units for the Baseline Human Health Risk Assessment - Edible Fish

Exposure Medium/Unit	Exposure Unit Name	Approximate Mile Point Segment or Location
Bound Brook (from adjacent to former CDE facility to Green Brook, including New Market Pond)	EU-BBF	6.7 - 0.0
Spring Lake	EU-SLF	--

Notes:
1) The investigation area depicted on the map is based on approximately 7.3 miles of Bound Brook and the associated FEMA 100-yr floodplain. The base map features such as aerials and streams utilize data from the NJ state agencies such as DEP. Since the datasets were collected from several sources, the features may not align completely.
2) Final surface water sampling locations will be determined upon completion of investigation into the groundwater/surface water transition zone
3) Additional information regarding BHHR units is provided in Table 5-1 of the Final RI Work Plan

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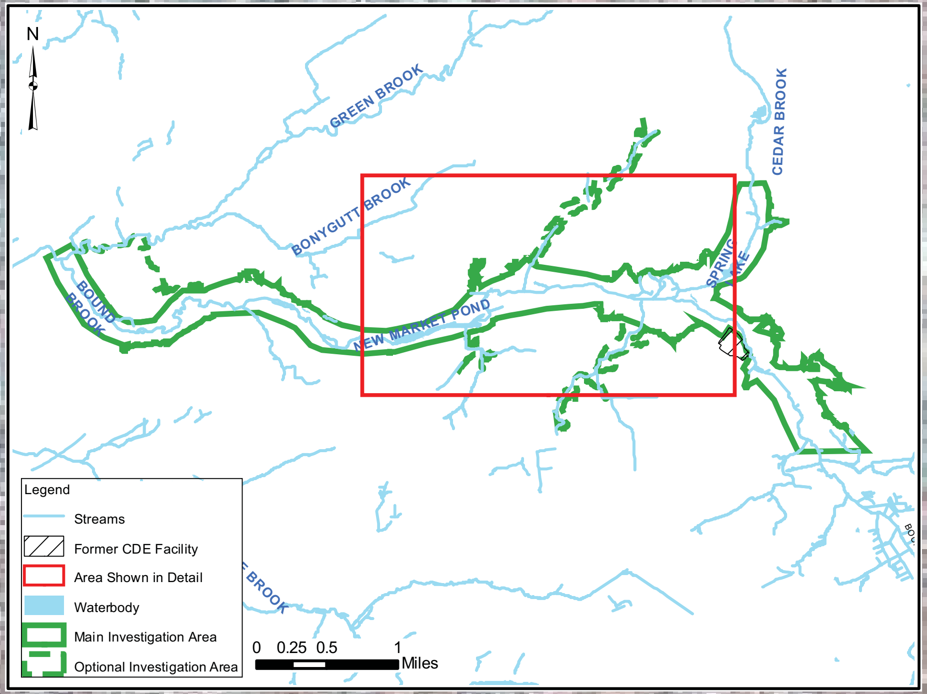
Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Proposed Sediment, Soil, and Surface Water Sampling Locations

OU4 Remedial Investigation/Feasibilty Study

July 2010

Figure 5-3f



Notes:
1) The investigation area depicted on the map is based on approximately 7.3 miles of Bound Brook and the associated FEMA 100-yr floodplain. The base map features such as aerials and streams utilize data from the NJ state agencies such as DEP. Since the datasets were collected from several sources, the features may not align completely.
2) Final surface water sampling locations will be determined upon completion of investigation into the groundwater/surface water transition zone
3) Additional information regarding BHHR units is provided in Table 5-1 of the Final RI Work Plan

Preliminary OU4 Exposure Units for the Baseline Human Health Risk Assessment - Edible Fish

Exposure Medium/Unit	Exposure Unit Name	Approximate Mile Point Segment or Location
Bound Brook (from adjacent to former CDE facility to Green Brook, including New Market Pond)	EU-BBF	6.7 - 0.0
Spring Lake	EU-SLF	--

MALCOLM PIRNIE

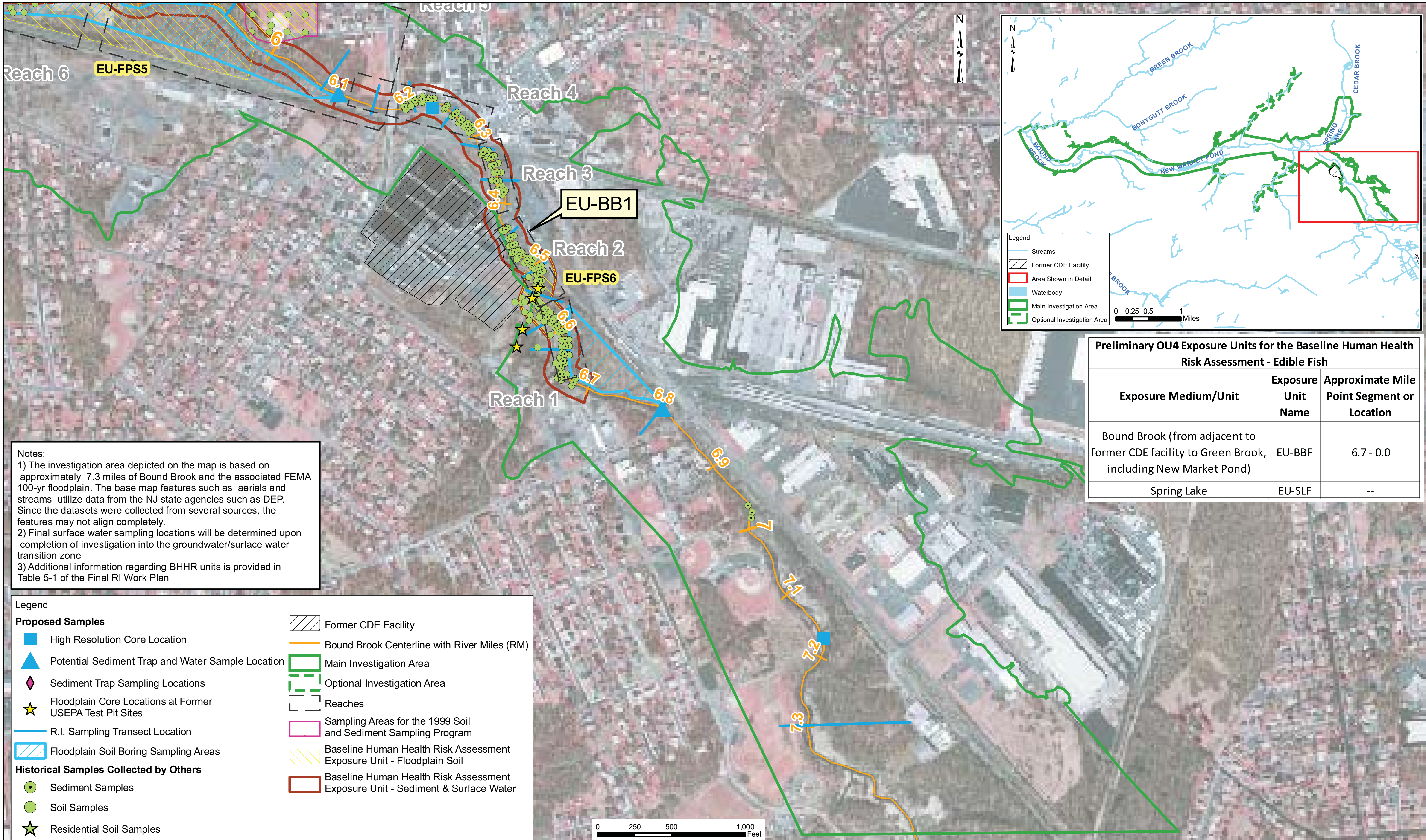
Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

Proposed Sediment, Soil, and Surface Water Sampling Locations

OU4 Remedial Investigation/Feasibilty Study

July 2010

Figure 5-3g



Notes:
1) The investigation area depicted on the map is based on approximately 7.3 miles of Bound Brook and the associated FEMA 100-yr floodplain. The base map features such as aerials and streams utilize data from the NJ state agencies such as DEP. Since the datasets were collected from several sources, the features may not align completely.
2) Final surface water sampling locations will be determined upon completion of investigation into the groundwater/surface water transition zone
3) Additional information regarding BHHR units is provided in Table 5-1 of the Final RI Work Plan

Preliminary OU4 Exposure Units for the Baseline Human Health Risk Assessment - Edible Fish

Exposure Medium/Unit	Exposure Unit Name	Approximate Mile Point Segment or Location
Bound Brook (from adjacent to former CDE facility to Green Brook, including New Market Pond)	EU-BBF	6.7 - 0.0
Spring Lake	EU-SLF	--

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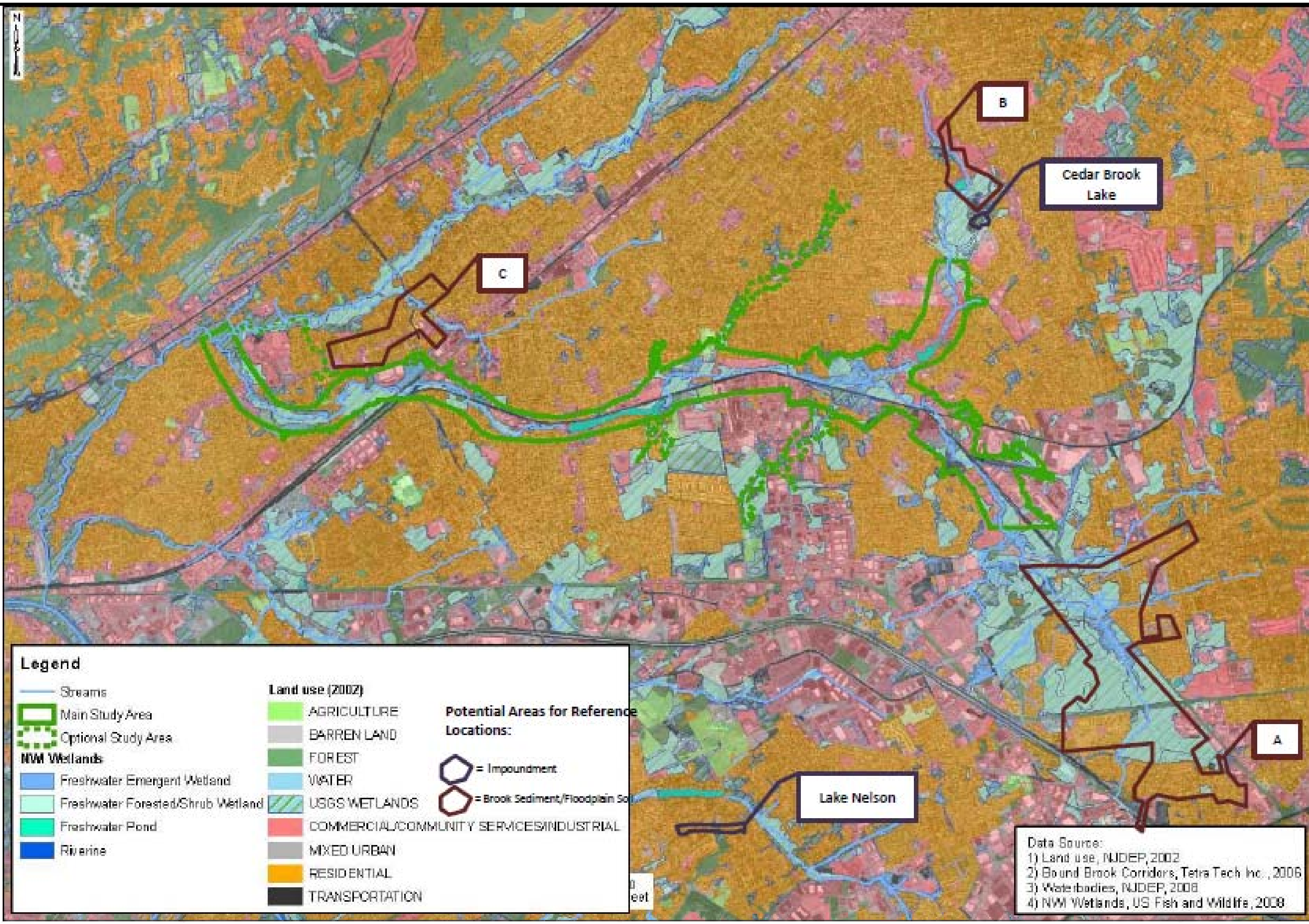
Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

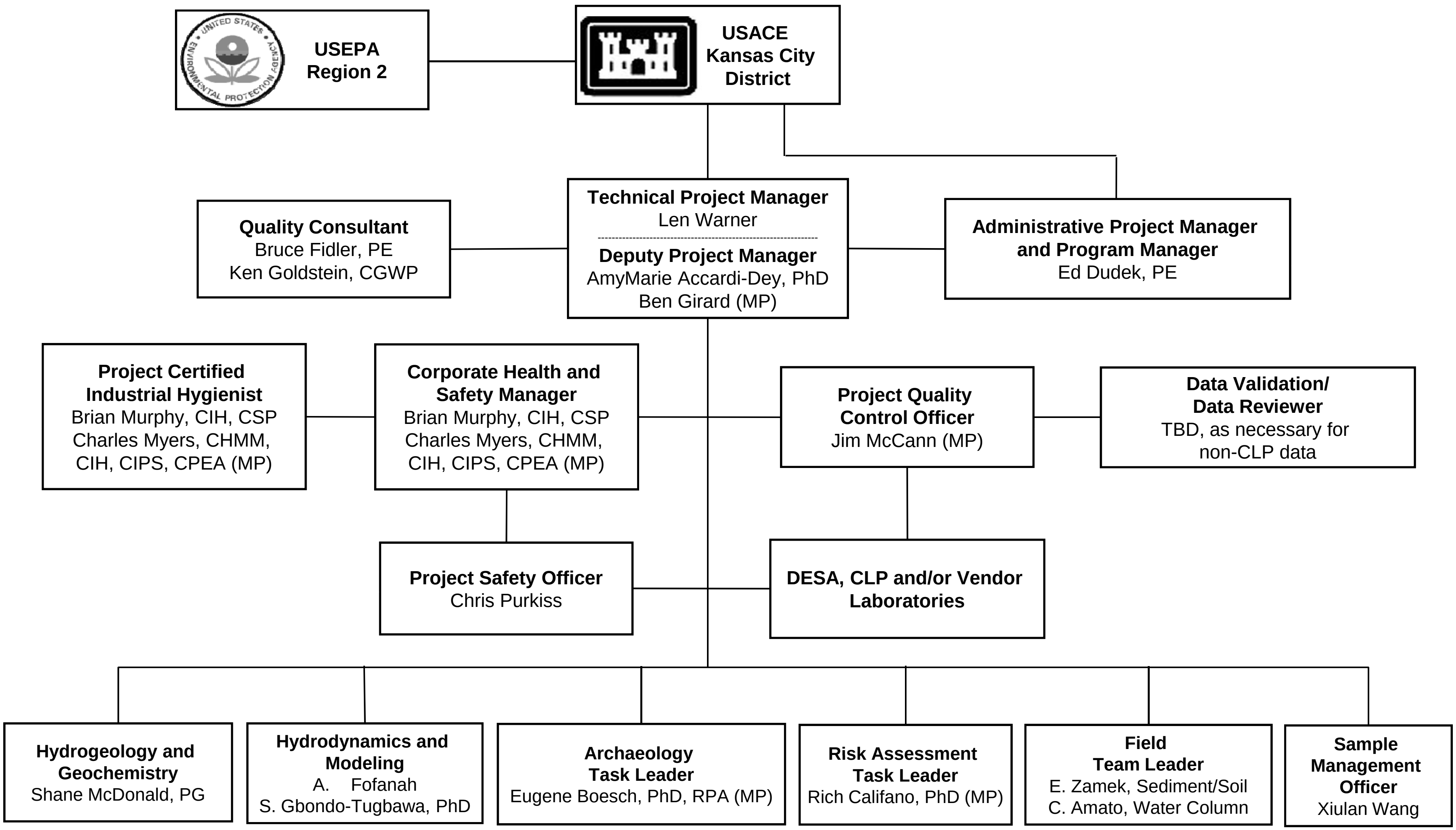
Proposed Sediment, Soil, and Surface Water Sampling Locations
OU4 Remedial Investigation/Feasibilty Study

July 2010

Figure 5-3h



MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	**Environmental Assessment Map** *OU4 Remedial Investigation/Feasibility Study*	July 2010 Figure 5-3i



Note: All staff are Louis Berger Group Inc. unless otherwise noted.

MALCOLM PIRNIE	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	**Project Team Organization Chart** *OU4 Remedial Investigation/Feasibility Study*	July 2010 Figure 7-1

Tables

TABLE 3-1
Summary of Sediment Samples Collected During the 1999 NJDEP Study

Sample Location	Shallow Sample Colleted?	Deep Sample Collected?	Analyses
1	x	x	PCB Aroclors and pesticides
2	x		PCB Aroclors and pesticides
3	x		PCB Aroclors and pesticides
4	x		PCB Aroclors and pesticides
5	x		PCB Aroclors and pesticides
6	x	x	PCB Aroclors and pesticides
7	x		PCB Aroclors and pesticides
8	x		PCB Aroclors and pesticides
9	x		PCB Aroclors and pesticides
10	x		PCB Aroclors and pesticides
11	x	x	PCB Aroclors and pesticides
12	x		PCB Aroclors and pesticides
13	x		PCB Aroclors and pesticides
14	x		PCB Aroclors and pesticides
15	x		PCB Aroclors and pesticides
16	x		PCB Aroclors and pesticides
17	x		PCB Aroclors and pesticides
18	x		PCB Aroclors and pesticides
19	x	x	PCB Aroclors and pesticides
20	x		PCB Aroclors and pesticides
21	x		PCB Aroclors and pesticides
22	x		PCB Aroclors and pesticides
23	x		PCB Aroclors and pesticides
24	x		PCB Aroclors and pesticides
25	x		PCB Aroclors and pesticides
26	x		PCB Aroclors and pesticides
27	x		PCB Aroclors and pesticides
28	x		PCB Aroclors and pesticides
29	x		PCB Aroclors and pesticides
30	x		PCB Aroclors and pesticides
31	x		PCB Aroclors and pesticides
32	x		PCB Aroclors and pesticides
33	x	x	PCB Aroclors and pesticides

TABLE 3-2
Constituents Detexted in Samples Collected During the 1999 NJDEP Study

Sample ID	Location	Start Depth (inches)	End Depth (inches)	4,4'- DDD (ug/kg)	4,4'- DDE (ug/kg)	4,4'- DDT (ug/kg)	alpha-Chlordane (ug/kg)	Endosulfan sulfate (ug/kg)	Endrin aldehyde (ug/kg)	Endrin ketone (ug/kg)	gamma-Chlordane (ug/kg)	Heptachlor epoxide (ug/kg)
1S	Cedar Brook	0	6			6.6	9.9				9.2	
1D	Cedar Brook	18	24		14	26	12				10	
2S	Cedar Brook	0	6			33	16				15	
3S	Cedar Brook	0	6		39	690	99	31	30	90	69	22
4S	Cedar Brook	0	6			51	20				20	6.9
5S	Cedar Brook	0	6			28	18			14	18	
6S	Cedar Brook	0	6			24	20			12	18	
7S	Cedar Brook	0	6			16	12				10	
8S	Cedar Brook	0	6			19	9.5				8.7	
9S	Cedar Brook	0	6	14		79	27		17		23	
10S	Cedar Brook	0	6			17						
11S	Cedar Brook	0	6	24	31	110	29		22		27	
12S	Cedar Brook	0	6	14		31	10		9.4		8.6	
13S	Cedar Brook	0	6	40		66	51		12		41	13
14S	Cedar Brook	0	6	15		43	20				22	
15S	Cedar Brook	0	6	29		61	21				20	
16S	Cedar Brook	0	6	35	14	59	20				19	
17S	Cedar Brook	0	6	91	48	160	100				89	23
18S	Cedar Brook	0	6				100				84	
19S	Cedar Brook	0	6				25				20	
19D	Cedar Brook	18	24								12	
21S	Cedar Brook	0	6				39				30	
23S	Cedar Brook	0	6			64	53				34	
26S	Spring Lake	0	6				170				130	
27S	Spring Lake	0	6				58				49	
28S	Spring Lake	0	6				57				51	
29S	Spring Lake	0	6				120				110	
31S	Spring Lake	0	6				82				75	
32S	Spring Lake	0	6				130				120	
33D	Spring Lake	18	24								9.8	
Sediment Guidance (ug/kg)				8	n/a	7	7	n/a	n/a	n/a	7	n/a

Notes:
Shallow samples are denoted by an "S" (*e.g.,* 1S)
Deep samples are denoted by a "D" (*e.g.,* 1D)
n/a = No guidance value available
Sediment guidance values represet the lowest effects level at which benthic impact may begin to occur (tolerate by most benthic organisms) and are presented as provided in the NJDEP report on Spring Lake. Values have been converted from ppm to ppb.

TABLE 3-3
Summary Statistics for Shallow Samples

Summary Statistic	4,4'- DDD	4,4'- DDE	4,4'- DDT	alpha-Chlordane	Endosulfan sulfate	Endrin aldehyde	Endrin ketone	gamma-Chlordane	Heptachlor epoxide
Count	8	4	18	26	1	5	3	26	4
Minimum concentration	14	14	6.6	9.5	31	9.4	12	8.6	6.9
Maxiumun concentration	91	48	690	170	31	30	90	130	23
Mean concentration	32.8	33.0	86.5	50.6	N/A	18.1	38.7	43.1	16.2
Median concentration	26.5	35.0	47.0	28.0	N/A	17.0	14.0	25.0	17.5
Standard deviation	25.5	14.4	155.2	44.2	N/A	8.2	44.5	36.7	7.7
Total # samples analyzed	33	33	33	33	33	33	33	33	33
Frequency of detection	24%	12%	55%	79%	3%	15%	9%	79%	12%

Notes:

All units concentrations are in ug/kg

Only detected results from the 0-6 inch horizon included

N/A = Not applicable

TABLE 3-4
Summary Statistics for Deep Samples

Summary Statistic	4,4'- DDE	4,4'- DDT	alpha-Chlordane	gamma-Chlordane
Count	1	1	1	3
Minimum concentration	14	26	12	9.8
Maxiumun concentration	14	26	12	12
Mean concentration	N/A	N/A	N/A	10.6
Median concentration	N/A	N/A	N/A	10
Standard deviation	N/A	N/A	N/A	1.2
Total # samples analyzed	5	5	5	5
Frequency of detection	20%	20%	20%	60%

Notes:
All units concentrations are in ug/kg
Only detected results from the 18-24 inch horizon included
N/A = Not applicable

TABLE 3-5
Preliminary Identification of Chemicals of Potential Concern (COPC) in Surface Water
Cornell-Dubilier Electronics Superfund Site OU4
South Plainfield, New Jersey

Chemical	**All Downstream Data [1]**		**Reference Data [2]**	**USEPA Regional Screening Level for Tap Water [3]**		**Potential ARAR Screening Level for Freshwater [4, 5]**		**Preliminary COPC? [Y/N] [6]**
	Frequency of Detection	Range of Detected Concentrations mg/L	Detected Concentration mg/L	mg/L	basis	mg/L	basis	
cis-1,2-Dichloroethene	2 / 7	0.002 - 0.003	ND	0.037	n	NA		N
trans-1,2-Dichloroethene	2 / 7	0.001 - 0.001	ND	0.011	n	0.059	5	N
Methyl tert butyl ether	1 / 7	0.002	0.001	0.012	c	0.07	5	N
1,1,2,2-Tetrachloroethane	2 / 7	0.001 - 0.002	ND	0.000067	c	0.004	4	Y
Trichloroethene	2 / 7	0.004 - 0.005	ND	0.0017	c	0.001	5	Y
bis(2-Ethylhexyl)phthalate	1 / 7	0.001	ND	0.0048	c	0.0012	5	N
di-n-Butyphthalate	1 / 7	0.001	ND	0.37	n	2	5	N
Diethylphthalate	1 / 7	0.001	ND	2.9	n	17	5	N
Metals [7]								
Aluminum	6 / 7	0.11 - 0.36	0.43	3.7	n	NA		N
Barium	7 / 7	0.08 - 0.14	0.15	0.73	n	2	5	N
Calcium*	7 / 7	44 - 80	61	NA		NA		N
Chromium	0 / 7	-	0.002	5.5	n	NA		N
Copper	5 / 7	0.004 - 0.005	0.02	0.15	n	1.3	5	N
Iron	7 / 7	0.23 - 0.93	0.7	2.6	n	NA		N
Lead	7 / 7	0.002 - 0.01	0.01	0.015	al	0.005	5	N
Magnesium*	7 / 7	8 - 13	12	NA		NA		N
Manganese	7 / 7	0.19 - 0.35	0.22	0.088	n	NA		Y
Nickel	5 / 7	0.001 - 0.004	0.0022	0.073	n	0.5	5	N
Potassium*	7 / 7	2 - 3	3	NA		NA		N
Sodium *	7 / 7	20 - 29	28	NA		NA		N
Vanadium	7 / 7	0.003 - 0.004	0.0035	0.018	n	NA		N
Zinc	7 / 7	0.02 - 0.08	0.03	1.1	n	7.4	5	N

Notes
1 = Downstream data are from locations A1 to A7 (Phase II) from the 1999 Ecological Evaluation (USEPA, 1999)
2 = Reference data are from location A9 (Phase II) from the 1999 Ecological Evaluation (USEPA, 1999).
3 = USEPA Regional Screening Levels (RSL) (12SEP2008) were accessed online at http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm. Since there is no RSL for lead, USEPA the action level (al) for drinking water is used as the screening level.
n = RSL is based on noncancer endpoint
c = RSL is based on cancer endpoint
4 = National Recommended Water Quality Criteria (NRWCQ) for the protection of human health, based on consumption of organisms only.
5 = New Jersey Surface Water Quality Criteria for Toxic Substances, Fresh Water (FW2) Criteria for human health.
6 = Chemicals are identified as preliminary COPCs where the maximum detected concentration in All Downstream Data is greater than the corresponding RSL or RWQC, or where no RSL is available, except for the essential nutrients (i.e., calcium, magnesium, potassium, and sodium), which are categorically eliminated as COPCs.
7 = Metals data are from unfiltered samples.
* Essential nutrient
NA = Not available
ND = Not detected

TABLE 3-6
Preliminary Identification of Chemicals of Potential Ecological Concern (COPEC) in Surface Water
Cornell-Dubilier Electronics Superfund Site OU4
South Plainfield, New Jersey

Chemical	**All Downstream Data [1]**		**Reference Data [2]**	**USEPA National Recommended Water Quality Criteria [3]**		**New Jersey Surface Water Quality Criteria [4]**		**Lowest ORNL Values [5]**		**Preliminary COPEC [6, 7] [Y/N?]**
	Frequency of Detection	Range of Detected Concentrations mg/L	Detected Concentration mg/L	mg/L	basis	mg/L	basis	mg/L	basis	
Volatile Organic Compounds										
cis-1,2-Dichloroethene	2 / 7	0.002 - 0.003	ND	NA		NA		0.59	a	N
trans-1,2-Dichloroethene	2 / 7	0.001 - 0.001	ND	NA		NA		0.59	a	N
Methyl tert butyl ether	1 / 7	0.002	0.001	NA		NA		NA		Y
1,1,2,2-Tetrachloroethane	2 / 7	0.001 - 0.002	ND	NA		NA		0.24	b, c	N
Trichloroethene	2 / 7	0.004 - 0.005	ND	NA		NA		0.047	a	N
Semi-Volatile Organic Compounds										
bis(2-Ethylhexyl)phthalate	1 / 7	0.001	ND	NA	a	NA		<0.0003	b, d	Y
di-n-Butyphthalate	1 / 7	0.001	ND	NA		NA		0.0094	b	N
Diethylphthalate	1 / 7	0.001	ND	NA		NA		0.22	e,f	N
Metals [8]										
Aluminum	1 / 7	0.081 - 0.081	ND	0.087	b, c, d	NA		0.087	b	N
Barium	7 / 7	0.08 - 0.12	0.14	NA		NA		0.0039	e, f	Y
Calcium*	7 / 7	46 - 86	58	NA		NA		NA		N
Chromium	1 / 7	0.002 - 0.002	ND	0.074	e, f, g	0.024	a, b	<0.044	g	N
Copper	2 / 7	0.003 - 0.004	0.004	0.0019	h	0.0085	a	0.00023	g	Y
Iron	7 / 7	0.05 - 0.1	0.06	1	i	NA		1	b	N
Lead	5 / 7	0.002 - 0.003	0.004	0.0025	e, f, j, k	0.0054	c, d	0.00132	b	Y
Magnesium*	7 / 7	8 - 14	11	NA		NA		NA		N
Manganese	7 / 7	0.01 - 0.32	0.2	NA		NA		0.08	e, f	Y
Nickel	7 / 7	0.01 - 0.02	0.03	0.052	e, f, g	0.044	a	0.005	h	Y
Potassium*	7 / 7	2.4 - 2.6	2.6	NA		NA		NA		N
Sodium *	7 / 7	21 - 28	27	NA		NA		NA		N
Vanadium	7 / 7	0.002 - 0.003	0.002	NA		NA		0.019	e, f	N
Zinc	7 / 7	0.01 - 0.03	0.03	0.12	e, f, g	0.114	a	0.03	h	N

Notes

1 = Downstream data are from locations A1 to A7 (Phase II) from the 1999 Ecological Evaluation (USEPA, 1999).
2 = Reference data are from location A9 (Phase II) from the 1999 Ecological Evaluation (USEPA, 1999).
3 = USEPA National Recommended Water Quality Criteria for freshwater accessed online at:
http://www.epa.gov/waterscience/criteria/wqctable/. All values are criterion continuous concentrations (CCC).
a = There is a full set of aquatic life toxicity data that show that bis(2-ethylhexyl)phthalate is not toxic to aquatic organisms at or below its solubility limit.
b = This value for aluminum is expressed in terms of total recoverable metal in the water column.
c = for a pH range of 6.5 - 9.0.
d = There are three major reasons why the use of Water-Effect Ratios might be appropriate.
1. The value of 87 µg/l is based on a toxicity test with the striped bass in water with pH = 6.5 – 6.6 and hardness <10 mg/L.
2. In tests with the brook trout at low pH and hardness, effects increased with increasing concentrations of total aluminum even though the concentration of dissolved aluminum was constant, indicating that total recoverable is a more appropriate measurement than dissolved, at least when particulate aluminum is primarily aluminum hydroxide particles.
3. The USEPA is aware of field data indicating that many high quality waters in the U.S. contain more than 87 g aluminum/L, when either total recoverable or dissolved is measured.
e = Freshwater criteria for metals are expressed in terms of the dissolved metal in the water column. The recommended water quality criteria value was calculated by using the previous 304(a) aquatic life criteria expressed in terms of total recoverable metal, and multiplying it by a conversion factor.
f = The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. The value given here corresponds to a hardness of 100 mg/L.
g = This recommended criterion is based on a 304(a) aquatic life criterion that was issued in the 1995 Updates: Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water, (EPA-820-B-96-001, September 1996).
h = Crierion is for dissolved copper based on the biotic ligand model (EPA-822-R-07-001). When the concentration of dissolved organic carbon is elevated, copper is substantially less toxic and use of Water-Effect Ratios might be appropriate.
i = The derivation of this value is presented in the Red Book (EPA 440/9-76-023, July, 1976).
j = This water quality criterion is based on a 304(a) aquatic life criterion that was derived using the 1985 Guidelines issued in EPA 440/5-84-027.
k = the USEPA is actively working on this criterion and so this recommended water quality criterion may change substantially in the near future.
CCC = The Criterion Continuous Concentration is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect.
4 = New Jersey Surface Water Quality Criteria for Toxic Substances, Fresh Water (FW2) Criteria for aquatic life, chronic.
a = The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. The value given here corresponds to a hardness of 100 mg/L.
b = Criterion is for chromium (III).
c = Criterion is expressed as a function of the Water Effect Ratio (WER). For criterion in the table, WER equates to the default value of 1.0.
d = Dissolved criterion
5 = Lowest ORNL value from Suter and Tsao (1996).
a = Tier II secondary chronic value from the USEPA's Proposed Water Quality for the Great Lakes System.
b = USEPA Region IV Chronic Screening Value.
c = One species.
d = Two species.
e = OSWER value calculated using the Great Lakes Water Quality Initiative Tier II Methodology.
f = OSWER value calculated in Suter and Mabrey, 1994.
g = Lowest chronic value for daphnids.
h = Lowest chronic value for aquatic plants.
6 = Chemicals are identified as preliminary COPECs where the maximum detected concentration in All Downstream Data is greater than the corresponding screening value, or where no screening value is available, except for the essential nutrients (*i.e.* , calcium, magnesium, potassium, and sodium), which were categorically eliminated as COPECs.
7 = Although PCBs, DDT and mercury were not detected in the 1999 Ecological Evaluation, the "Derivation of New Jersey-Specific Wildlife Values as Surface Water Quality Criteria for: PCBs, DDT, and Mercury" (July 2001) will be also be used as ESVs in the event these chemicals are detected during the RI.
8 = Metals data are from filtered samples.
* Essential nutrient
NA = Not available
ND = Not detected

TABLE 3-7
Preliminary Identification of Chemicals of Potential Concern (COPC) and Potential Ecological Concern (COPEC) in Sediment
Cornell-Dubilier Electronics Superfund Site OU4
South Plainfield, New Jersey

Chemical	Data Summary: All Downstream Data [1] Frequency of Detection	Data Summary: All Downstream Data [1] Range of Detected Concentrations mg/kg	Data Summary: All Reference Data [2] Frequency of Detection	Data Summary: All Reference Data [2] Range of Detected Concentrations mg/kg	Preliminary COPC Selection for Human Health Evaluation: USEPA Regional Screening Level for Residential Soil [3] mg/kg	basis	Preliminary COPC? [Y/N] [4]	Preliminary COPEC Selection for Ecological Evaluation: Consensus-Based Sediment Quality Guidelines (TECs) [5] mg/kg	basis	Lowest ORNL Value [6] mg/kg	basis	NJDEP Ecological Screening Criteria Fresh Water Sediment Criteria [7] Lowest Effects Level mg/kg	basis	Severe Effects Level mg/kg	basis	Bioaccumulative? [8] [Y/N?]	Preliminary COPEC [9] [Y/N?]
Volatile Organic Compounds																	
Acetone	20 / 25	0.01 - 7.7	4 / 4	0.01 - 3.1	6,100	n	N	NA		0.041	a, b	NA		NA		N	Y
2-Butanone (methyl ethyl ketone)	2 / 25	0.01 - 0.01	1 / 4	0.004 - 0.004	2,800	ns	N	NA		1.3	a, b	NA		NA		N	N
n-Butylbenzene	1 / 25	0.03	0 / 4	ND	NA		Y	NA		NA		NA		NA		N	Y
Carbon disulfide	1 / 25	0.03	0 / 4	ND	67	ns	N	NA		0.004	a	NA		NA		N	Y
Chloroethane (ethyl chloride)	1 / 25	0.03	0 / 4	ND	1,500	ns	N	NA		NA		NA		NA		N	Y
Chloromethane	2 / 25	0.07 - 0.13	0 / 4	ND	1.7	c	N	NA		NA		NA		NA		N	Y
1,2-Dichloroethane	1 / 25	0.002	0 / 4	ND	0.45	c	N	NA		1.2	a	0.26	a	NA		N	N
2-Hexanone	1 / 25	0.05	0 / 4	ND	NA		Y	NA		0.1	a, b	NA		NA		N	N
p-Isopropyltoluene	2 / 25	0.001 - 0.08	1 / 4	0.01 - 0.01	NA		Y	NA		NA		NA		NA		N	Y
Methylene chloride	10 / 25	0.01 - 0.08	2 / 4	0.05 - 0.05	11	c	N	NA		1.7	a	0.159	a	NA		N	N
Methyl tert butyl ether	1 / 25	0.002	1 / 4	0.01 - 0.01	39	c	N	NA		NA		NA		NA		N	Y
Naphthalene	1 / 25	0.02	0 / 4	ND	3.9	c	N	0.176		1.1	a	0.176	a	NA		Y	N
Toluene	6 / 25	0.005 - 1.9	3 / 4	0.002 - 0.09	500	ns	N	NA		0.24	a	1.22	a	NA		N	Y
1,2,3-Trichlorobenzene	1 / 25	0.02	0 / 4	ND	NA		Y	NA		NA		NA		NA		N	Y
1,1,1-Trichloroethane	1 / 25	0.02	0 / 4	ND	900	ns	N	NA		0.14	a	0.213	a	NA		N	N
Semi-Volatile Organic Compounds																	
Acenaphthene	1 / 25	0.26	0 / 4	ND	340	n	N	NA		6.1	c, d	0.00671	a	NA		Y	Y
Acenaphthylene	2 / 25	0.6 - 3.1	0 / 4	ND	NA		Y	NA		NA		0.00587	a	NA		Y	Y
Anthracene	9 / 25	0.25 - 3.9	0 / 4	ND	1,700	n	N	0.0572		0.13	e	0.22 (0.0572)	b (a)	370		Y	Y
Benzidine	16 / 25	4.6 - 81	2 / 4	9.7 - 10	0.0005	c	Y	NA		0.008	a, b	NA		NA		N	Y
Benzo(a)anthracene	21 / 25	0.57 - 8.3	4 / 4	1 - 3.9	0.15	c	Y	0.108		0.52	a	0.32 (0.108)	b (a)	1,480		Y	Y
Benzo(a)pyrene	21 / 25	0.14 - 13	4 / 4	1.4 - 5.8	0.015	c	Y	0.15		0.66	a	0.37 (0.15)	b (a)	1,440		Y	Y
Benzo(b)fluoranthene	21 / 25	0.77 - 11	4 / 4	1.5 - 5.4	0.15	c	Y	NA		NA		10.4	a	NA		Y	Y
Benzo(g,h,i)perylene	20 / 25	0.4 - 3.1	4 / 4	1 - 3.5	NA		Y	NA		0.8	f	0.17		320		Y	Y
Benzo(k)fluoranthene	17 / 25	0.23 - 9.1	2 / 4	1.4 - 5.2	1.5	c	Y	NA		1.1	f	0.24		1,340		Y	Y
Benzoic acid	5 / 25	0.3 - 0.57	0 / 4	ND	24,000	nm	N	NA		NA		NA		NA		N	Y
Butylbenzylphtalate	11 / 25	0.38 - 11	0 / 4	ND	260	c	N	NA		52	a	1.97	a	NA		N	Y
Chrysene	21 / 25	0.61 - 9.4	4 / 4	1.4 - 4.9	15	c	N	0.166		1.6	f	0.34 (0.166)	b (a)	460		Y	Y
Dibenz(a,h)anthracene	1 / 25	2.4	1 / 4	1.3 - 1.3	0.015	c	Y	0.033		0.13	g	0.06 (0.033)	b (a)	130		Y	Y
2,6-Dinitrotoluene	1 / 25	0.47	0 / 4	ND	6.1	n	N	NA		NA		NA		NA		N	Y
bis(2-Ethylhexyl)phthalate	18 / 25	0.95 - 170	2 / 4	0.87 - 1.6	35	c	Y	NA		4203	a	0.182	a	0.75	c	N	Y
Fluoranthene	22 / 25	0.2 - 16	4 / 4	2.3 - 9.3	230	n	N	0.423		0.30	g	0.75 (0.423)	b (a)	1,020		N	Y
Fluorene	1 / 25	1.4	0 / 4	ND	230	n	N	0.0774		0.16	g	0.19 (0.0774)	b (a)			Y	Y
Indeno(1,2,3-cd)pyrene	19 / 25	0.32 - 7.5	4 / 4	0.97 - 3.2	0.15	c	Y	NA		0.37	g	0.2		320		Y	Y
3 & 4 Methylphenol	6 / 25	0.38 - 37	0 / 4	ND	31	n	Y	NA		NA		NA		NA		N	Y
di-n-Octylphthalate	16 / 25	0.2 - 35	0 / 4	ND	NA		Y	NA		NA		NA		NA		N	Y
Phenanthrene	21 / 25	0.51 - 14	4 / 4	0.95 - 4.1	NA		Y	0.204		2.6	f	0.56 (0.204)	b (a)	950		Y	Y
Pyrene	23 / 25	0.14 - 17	4 / 4	2.1 - 8.2	170	n	N	0.195		2.31	f	0.49 (0.195)	b (a)	850		Y	Y
Polychlorinated Biphenyls/Pesticides																	
Aroclor 1254	16 / 25	0.03 - 14	0 / 4	ND	0.11	n	Y	0.0598	a	0.3	f, h	0.06		34		Y	Y
4,4'-DDD	1 / 25	0.03	0 / 4	ND	2	c	N	0.00488		0.0094	f	0.008 (0.00488)	b (a)	6		Y	Y
Dieldrin	3 / 25	0.02 - 0.3	0 / 4	ND	0.03	c	Y	0.0019		0.04	f	0.002 (0.0019)	b (a)	91		Y	Y
Metals																	
Aluminum	25 / 25	2,400 - 18,000	4 / 4	5,300 - 9,800	7,700	n	Y	NA		58,030	i	2.55%	c	NA		N	N
Antimony	17 / 25	0.38 - 3.5	2 / 4	1.3 - 1.5	3.1	n	Y	NA		NA		NA		3	c	N	Y
Arsenic	25 / 25	0.82 - 23	4 / 4	2.4 - 6.2	0.39	c	Y	9.79		6	f	6 (9.979)	b (a)	33		N	Y
Barium	25 / 25	23 - 420	4 / 4	87 - 260	1,500	n	N	NA		NA		NA		NA		N	Y
Beryllium	22 / 25	0.2 - 1.4	2 / 4	0.68 - 0.7	16	n	N	NA		NA		NA		NA		N	Y
Cadmium	22 / 25	0.67 - 23	4 / 4	0.67 - 13	7	n	Y	0.99		0.592	g	0.6 (0.99)	b (a)	10		Y	Y
Calcium*	25 / 25	670 - 7,200	4 / 4	3,500 - 5,300	NA		N	NA		NA		NA		NA		N	N
Chromium	25 / 25	6.4 - 78	4 / 4	16 - 41	12,000	nm	N	43.4		26	f	26 (43.4)	b (a)	110		N	Y
Cobalt	25 / 25	2 - 30	4 / 4	3.6 - 9.1	2.3	n	Y	NA		NA		50	a			N	Y
Copper	25 / 25	6.4 - 220	4 / 4	20 - 81	310	n	N	31.6		16	f	16 (31.6)	b (a)	110		N	Y
Iron	25 / 25	7,300 - 36,000	4 / 4	9,200 - 19,000	5,500	n	Y	NA		NA		NA		NA		N	Y
Lead	25 / 25	9.2 - 350	4 / 4	53 - 290	400	n	N	35.8		31	f	31 (35.8)	b (a)	250		Y	Y
Magnesium*	25 / 25	910 - 6,900	4 / 4	2,700 - 3,600	NA		N	NA		NA		NA		NA		N	N
Manganese	25 / 25	66 - 1,100	4 / 4	130 - 680	180	n	Y	NA		460	f	630	c	1,100	c	N	Y
Mercury	22 / 25	0.04 - 0.91	4 / 4	0.08 - 0.43	2.3	n	N	0.18		NA		0.2 (0.174)	b (a)	2		Y	Y
Nickel	25 / 25	6.8 - 52	4 / 4	8.5 - 33	160	n	N	22.7		16	f	16 (22.7)	b (a)	75		N	Y
Potassium*	25 / 25	260 - 1,500	4 / 4	370 - 870	NA		N	NA		NA		NA		NA		N	N
Selenium	18 / 25	0.63 - 3.8	2 / 4	1.7 - 1.8	39	n	N	NA		NA		NA		NA		N	Y
Silver	19 / 25	0.13 - 11	3 / 4	1.1 - 5.1	39	n	N	NA		NA		0.5	a	NA		N	Y
Sodium*	25 / 25	50 - 480	4 / 4	74 - 240	NA		N	NA		NA		NA		NA		N	N
Vanadium	25 / 25	8.9 - 58	4 / 4	20 - 39	39	n	Y	NA		NA		NA		NA		N	Y
Zinc	25 / 25	51 - 670	4 / 4	73 - 300	2,300	n	N	121		120	f	120 (121)	b (a)	820		N	Y

TABLE 3-7
Preliminary Identification of Chemicals of Potential Concern (COPC) and Potential Ecological Concern (COPEC) in Sediment
Cornell-Dubilier Electronics Superfund Site OU4
South Plainfield, New Jersey

Notes

1 = Downstream data are from locations A1 to A7 (Phase II) and A11 to A13 (Phase III) from the 1999 Ecological Evaluation (USEPA, 1999).
2 = Reference data are from locations A9 (Phase II) and A10 (Phase III) from the 1999 Ecological Evaluation (USEPA, 1999).
3 = USEPA Regional Screening Levels (RSL) (12SEP2008) were accessed online at http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm.
c = RSL is based on a target cancer risk of 1E-06.
m = Concentration may exceed ceiling limit.
n = RSL is based on potential for adverse, non-cancer health effects. With the exception of lead, screening levels based on non-cancer health effects were reduced by 1/10 to represent a target hazard quotient
s = Concentration may exceed C_{sat}.
4 = Chemicals are identified as preliminary COPCs where the maximum detected concentration in All Downstream Data is greater than the corresponding RSLs or where no RSL is available, except for the essential nutrients (, calcium, magnesium, potassium, and sodium), which are categorically eliminated as COPCs.
5 = Consensus-Based Threshold Effects Concentrations (TECs) based on the geometric mean of several screening values from MacDonald et al. (2000).
a = Value for total PCBs.
6 = Lowest ORNL Value from Jones et al. (1997). Values for nonionic organic chemicals are based on the USEPA equillibrium partitioning approach and are adjusted for a site-specific average TOC of 4.7%.
a = Secondary chronic value.
b = Equillibrium partitioning is likely to provide a conservative estimate of exposure for this polar nonionic chemical.
c = Value based on a chronic National Ambient Water Quality Criterion.
d = Proposed USEPA sediment quality criteria.
e = Lowest chronic value for fish.
f = Ontario Ministry of the Environment Lowest Effects Level is the 5th percentile of the screening level concentration, unless otherwise noted.
g = Threshold Effects Concentration from the Assessment and Remediation of Contaminated Sediments Program (USEPA, 1996).
h = Tentative guideline is the 10th percentile of the screening level concentration.
i = Probable Effects Concentration from the Assessment and Remediation of Contaminated Sediments Program (USEPA, 1996).
7 = New Jersey Department of Environmental Protection, Site Remediation Program, Ecological Screening Criteria.
a = USEPA Region 5, RCRA Ecological Screening Levels (ESLs) represent a protective benchmark (e.g., water quality criteria, sediment quality guidelines/ criteria, and chronic no adverse effect levels) for 223 contaminants and are not intended to serve as cleanup levels, but are intended to function as screening levels.
b = Lowest Effect Level, dry weight (Persaud et al., 1993).
c = Sediment value from the NOAA Screening Quick Reference Tables (SQuiRTs).
8 = Identified as bioaccumulative based on the USEPA's Persistent, Bioaccumulative, and Toxic (PBT) Chemical Program (accessed online at: http://www.epa.gov/pbt/) or by the State of Washington Department of Ecology's PBT initiative (accessed online at: (http://www.ecy.wa.gov/programs/swfa/pbt/rule.html)
9 = Chemicals are identified as preliminary COPECs where the maximum detected concentration in All Downstream Data is greater than either screening value or where no screening value is available, except for the essential nutrients (calcium, magnesium, potassium, and sodium), which are categorically eliminated as COPECs.
* Essential nutrient
NA = Not available
ND = Not detected

TABLE 3-8
Preliminary Identification of Chemicals of Potential Concern (COPC) and Potential Ecological Concern (COPEC) in Floodplain Soil
Cornell-Dubilier Electronics Superfund Site OU4
South Plainfield, New Jersey

Chemical	Data Summary				Preliminary COPC Selection for Human Health Evaluation					Preliminary COPEC Selection for Ecological Evaluation							
	All Non-Reference Data (T1 to T3) [1]		Reference Area Data (T4) [1]		USEPA Regional Screening Level for Residential Soil [2]		NJDEP Soil Remediation Standard for Residential Direct Contact [3]		Preliminary COPC? [4] [Y/N]	USEPA Ecological Soil Screening Level [5]		USEPA Region 5 Ecological Screening Level [6]		NJDEP Ecological Screening Criteria [7]		Bioaccumulative? [8] [Y/N?]	Preliminary COPEC [9] [Y/N?]
	Frequency of Detection	Range of Detected Concentrations	Frequency of Detection	Range of Detected Concentrations													
		mg/kg		mg/kg	mg/kg	basis	mg/kg	basis		mg/kg	basis	mg/kg	basis	mg/kg	basis		
Volatile Organic Compounds																	
Acetone	11 / 19	0.04 - 0.71	5 / 6	0.17 - 0.25	6,100	n	7,000	n	N	NA		2.5	b	NA		N	N
Methylene chloride	1 / 19	0.04	5 / 6	0.03 - 0.05	11	c	34	c	N	NA		4.05	b	4.05	a	N	N
Toluene	1 / 19	0.005	0 / 6	ND	500	ns	630	n	N	NA		5.45	a	200	b	N	N
1,1,1-Trichloroethane	2 / 19	0.003 - 0.003	0 / 6	ND	900	ns	29	n	N	NA		29.8	a	29.8	c	N	N
Trichlorofluromethane	18 / 19	0.003 - 0.05	2 / 6	0.01 - 0.01	80	n	2,300	n	N	NA		16.4	a	NA		N	N
Semi-Volatile Organic Compounds																	
Acenaphthene	6 / 20	0.14 - 0.84	2 / 6	0.2 - 0.34	340	n	340	n	N	29	a	682	a	20	b	Y	N
Acenaphthylene	3 / 20	0.16 - 0.61	2 / 6	0.21 - 0.43	NA		NA		Y	29	a	682	a	682	c	Y	N
Acetophenone	5 / 20	0.13 - 0.29	0 / 6	ND	780	ns	0.2	n	Y	NA		300	a	NA		N	N
Anthracene	14 / 20	0.14 - 2.3	5 / 6	0.17 - 0.76	1,700	n	1,799	n	N	29	a	1,480	a	1,480	c	Y	N
Benzo(a)anthracene	20 / 20	0.25 - 9.5	6 / 6	0.45 - 6.4	0.15	c	0.6	c	Y	1.1	b	5.21	a	5.21	c	Y	Y
Benzo(a)pyrene	20 / 20	0.27 - 9.7	6 / 6	0.54 - 6.2	0.015	c	0.2	pql	Y	1.1	b	1.52	a	1.52	c	Y	Y
Benzo(b)fluoranthene	20 / 20	0.36 - 15	6 / 6	0.82 - 9.9	0.15	c	0.6	c	Y	1.1	b	59.8	a	59.8	c	Y	N
Benzo(g,h,i)perylene	20 / 20	0.26 - 6.4	6 / 6	0.34 - 3.6	NA		380,000	c	Y	1.1	b	119	a	119	c	Y	N
Benzo(k)fluoranthene	17 / 20	0.2 - 4.2	5 / 6	0.43 - 2.2	1.5	c	6	c	Y	1.1	b	148	a	148	c	Y	N
Benzoic acid	12 / 20	0.19 - 0.95	2 / 6	0.18 - 0.3	24,000	nm	NA		N	NA		NA		NA		N	Y
Butylbenzylphtalate	13 / 20	0.15 - 3.6	6 / 6	0.28 - 0.96	260	c	120	n	N	NA		0.239	a	0.239	c	N	Y
bis(2-Chloroisopropyl)ether	1 / 20	1	0 / 6	ND	NA		23	c	Y	NA		19.9	a	19.9	c	N	N
Chrysene	20 / 20	0.34 - 11	6 / 6	0.78 - 8.5	15	c	62	c	N	1.1	b	4.73	a	4.83	c	Y	Y
Dibenz(a,h)anthracene	2 / 20	0.62 - 1	1 / 6	0.33	0.015	c	0.2	pql	Y	1.1	b	18.4	a	18.4	c	Y	N
Dibenzofuran	8 / 20	0.23 - 0.66	1 / 6	0.22	NA		NA		Y	NA		NA		NA		Y	Y
Diethylphthalate	1 / 20	78	0 / 6	ND	4,900	n	4,900	n	N	NA		24.8	a	24.8	c	N	Y
Dimethylphthalate	2 / 20	0.61 - 3.6	0 / 6	ND	NA		NA		Y	NA		734	a	NA		N	N
Fluoranthene	20 / 20	0.46 - 12	6 / 6	0.75 - 11	230	n	230	n	N	29	a	122	a	122	c	Y	N
Fluorene	6 / 20	0.17 - 0.89	2 / 6	0.26 - 0.41	230	n	230	n	N	29	a	122	a	122	c	Y	N
Hexachlorobenzene	1 / 20	0.26	0 / 6	ND	0.3	c	0.3	c	N	NA		0.199	a	0.199	c	Y	Y
Indeno(1,2,3-cd)pyrene	20 / 20	0.2 - 6	6 / 6	0.37 - 3.6	0.15	c	0.6	c	Y	1.1	b	109	a	109	c	Y	N
2-Methylnaphthalene	10 / 20	0.15 - 1.7	2 / 6	0.18 - 0.27	31	n	23	n	N	NA		3.24	a	3.24	c	N	N
4-Methylphenol	5 / 20	0.14 - 0.82	0 / 6	ND	31	n	3.1	n	N	NA		163	a	NA		N	N
Naphthalene	15 / 20	0.14 - 0.86	3 / 6	0.16 - 0.37	3.9	c	6	c	N	29	a	0.0994	a	0.0994	c	Y	Y
di-n-Octylphthalate	6 / 20	0.23 - 0.92	0 / 6	ND	NA		240	n	Y	NA		709	a	NA		N	N
Phenanthrene	20 / 20	0.31 - 9.4	6 / 6	0.5 - 5.7	NA		NA		Y	29	a	45.7	a	45.7	c	Y	N
Pyrene	20 / 20	0.4 - 16	6 / 6	0.89 - 11	170	n	170	n	N	1.1	b	78.5	a	78.5	c	Y	N
1,2,4-Trichlorobenzene	5 / 20	0.12 - 3.2	0 / 6	ND	8.7	n	7.3	n	N	NA		11.1	a	20	d	Y	N
Polychlorinated Biphenyls/Pesticides																	
Aroclor 1254	14 / 20	7 - 580	6 / 6	1 - 14	0.11	n	0.2	c	Y	NA		0.00033	a	0.000332	c	Y	Y
4,4'-DDE	2 / 20	0.031 - 0.034	0 / 6	ND	1.4	c	2	c	N	0.021	f, g	0.596	a	0.596	c	Y	Y
Heptachlor	1 / 20	0.02	0 / 6	ND	0.11	c	0.1	c	N	NA		0.00598	a	0.00598	c	Y	Y
Metals																	
Aluminum	20 / 20	2200 - 30,000	6 / 6	9,900 - 21,000	7,700	n	7,800	n	Y	NA		NA		50	e	N	Y
Antimony	20 / 20	0.76 - 42	6 / 6	1.7 - 4	3.1	n	3.1	n	Y	0.27	f	0.142	a	0.27	f	N	Y
Arsenic	20 / 20	5.7 - 35	6 / 6	11 - 33	0.39	c	19	nb	Y	18	c	5.7	a	9.9	b, g	N	Y
Barium	20 / 20	91 - 1,500	6 / 6	72 - 310	1,500	n	1,600	n	N	330	d	1.04	a	283	h	N	Y
Beryllium	20 / 20	0.09 - 1.5	6 / 6	0.48 - 1.1	16	n	1.6	n	N	21	f	1.06	a	10	b	N	Y
Cadmium	20 / 20	1.4 - 38	6 / 6	2.8 - 16	7	n	7.8	n	Y	0.36	f	0.00222	a	0.36	f	Y	Y
Calcium*	20 / 20	600 - 9,800	6 / 6	970 - 4,200	NA		NA		N	NA		NA		NA		N	N
Chromium	20 / 20	9 - 280	6 / 6	20 - 170	12,000	nm	NA		N	26	e, h	0.4	c	26	i	N	Y
Cobalt	20 / 20	2.1 - 24	6 / 6	4.2 - 23	2.3	n	160	n	Y	13	c	0.14	a	0.14	c	N	Y
Copper	20 / 20	28 - 12,000	6 / 6	46 - 190	310	n	310	n	Y	28	e	5.4	a	5.4	c	N	Y
Iron	20 / 20	12,000 - 97,000	6 / 6	13,000 - 42,000	5,500	n	NA		Y	NA		NA		NA		N	Y
Lead	20 / 20	44 - 3,600	6 / 6	150 - 720	400	n	400	n	Y	11	e	0.0537	a	0.0537	c	Y	Y
Magnesium*	20 / 20	250 - 5,200	6 / 6	1,400 - 5,300	NA		NA		N	NA		NA		NA		N	N
Manganese	20 / 20	41 - 1,800	6 / 6	240 - 1,600	180	n	1,100	n	Y	220	c	NA		220	j	N	Y
Mercury	20 / 20	0.25 - 3.4	6 / 6	0.059 - 0.78	2.3	n	2.3	n	Y	NA		0.1	c	0.1	k	Y	Y
Nickel	20 / 20	9.2 - 150	6 / 6	14 - 55	160	n	160	n	N	38	c	13.6	a	13.6	c	N	Y
Potassium*	20 / 20	480 - 1,700	6 / 6	240 - 1,500	NA		NA		N	NA		NA		NA		N	N
Selenium	20 / 20	1.6 - 9.2	6 / 6	2 - 5	39	n	39	n	N	0.52	c	0.0276	a	0.0276	c	N	Y
Silver	20 / 20	2.2 - 16	6 / 6	2.8 - 11	39	n	39	n	N	4.2	e	4.04	a	4.04	c	N	Y
Sodium*	20 / 20	80 - 430	6 / 6	63 - 280	NA		NA		N	NA		NA		NA		N	N
Thallium	3 / 20	0.6 - 4	0 / 6	ND	0.51	n	0.5	n	Y	NA		0.0569	a	1	b	N	Y
Vanadium	20 / 20	23 - 70	6 / 6	36 - 95	39	n	7.8	n	Y	7.8	e	1.59	a	2	b	N	Y
Zinc	20 / 20	31 - 2,000	6 / 6	88 - 360	2,300	n	2,300	n	N	46	e	6.62	c	6.62	c	N	Y

TABLE 3-8
Preliminary Identification of Chemicals of Potential Concern (COPC) and Potential Ecological Concern (COPEC) in Floodplain Soil
Cornell-Dubilier Electronics Superfund Site OU4
South Plainfield, New Jersey

Notes

1 = Data are from the 1999 Ecological Evaluation (USEPA, 1999).
2 = USEPA Regional Screening Levels (RSL) (12SEP2008) were accessed online at http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm.
  c = RSL is based on a target cancer risk of 1E-06.
  m = Concentration may exceed ceiling limit.
  n = RSL is based on potential for adverse, non-cancer health effects. With the exception of lead, screening levels based on non-cancer health effects were reduced by 1/10 to represent a target hazard quotient of 0.1 per USEPA Region 2 guidance.
  s = Concentration may exceed C_{sat}.
3 = New Jersey Department of Environmental Protection Soil Remediation Standards (SRS), Residential Direct Contact
  c = SRS is based on a target cancer risk of 1E-06.
  n = SRS is based on potential for adverse, non-cancer health effects. With the exception of lead, screening levels based on non-cancer health effects were reduced by 1/10 to represent a target hazard quotient of 0.1 for consistency with the USEPA RSLs.
  nb = Natural background
  pql = Practical quantitation limit
4 = Chemicals are identified as preliminary COPCs where the maximum detected concentration in the All Non-Reference Data is greater than the corresponding RSL or Potential ARAR screening level, or where no RSL is available, except for the essential nutrients (*i.e.* , calcium, magnesium, potassium, and sodium), which are categorically eliminated as COPCs.
5 = USEPA Ecological soil Screening Level (Eco SSL); the lowest available EcoSSL was selected.
  a = For low molecular weight PAHs.
  b = For high molecular weight PAHs.
  c = Based on exposure to plants.
  d = Based on exposure to invertebrates.
  e = Based on exposure to avian receptors.
  f = Based on exposure to mammalian receptors.
  g = For DDT and metabolites.
  h = For chromium III.
6 = USEPA Region 5 Ecological Screening Level.
  a = Based on exposure to a masked shrew (*Sorex cinerus*).
  b = Based on exposure to a meadow vole (*Microtus pennsylvanicus*).
  c = Based on exposure to soil invertebrates (e.g., earthworms).
7 = New Jersey Department of Environmental Protection, Site Remediation Program, Ecological Screening Criteria.
  a = Ecological Screening Criterion is a USEPA Region 5 Ecological Screening Level based on exposure to meadow vole (*Microtus pennsylvanicus*).
  b = Ecological Screening Criterion is a Wildlife Preliminary Remediation Goal based on plant study.
  c = Ecological Screening Criterion is a USEPA Region 5 Ecological Screening Level based on exposure to masked shrew (*Sorex cinerus*).
  d = Ecological Screening Criterion is a Wildlife Preliminary Remediation Goal based on earthworm study.
  e = Ecological Screening Criterion is a terrestrial plant tox benchmark.
  f = Ecological Screening Criterion is the lowest EcoSSL and is based mammalian exposure.
  g = Ecological Screening Criterion is a Wildlife Preliminary Remediation Goal based on shrew study.
  h = Ecological Screening Criterion is a Wildlife Preliminary Remediation Goal based on woodcock study.
  i = Ecological Screening Criterion is the lowest EcoSSL and is based avian exposure.
  j = Ecological Screening Criterion is the lowest EcoSSL and is based plant exposure.
  k = Ecological Screening Criterion is a USEPA Region 5 Ecological Screening Level based on exposure to a soil invertebrates (e.g., earthworms).
8 = Identified as bioaccumulative based on the USEPA's Persistent, Bioaccumulative, and Toxic (PBT) Chemical Program (accessed online at: http://www.epa.gov/pbt/) or by the State of Washington Department of Ecology's PBT initiative (accessed online at: http://www.ecy.wa.gov/programs/swfa/pbt/rule.html)
9 = Chemicals are identified as preliminary COPECs where the maximum detected concentration in the All Non-Reference Data is greater than the corresponding ecological screening value or where no ecological screening value is available, except for the essential nutrients (*i.e.* , calcium, magnesium, potassium, and sodium), which are categorically eliminated as COPECs.
* Essential nutrient
NA = No available
ND = Not detected

TABLE 3-9
Preliminary Identification of Chemicals of Potential Concern (COPC) in Edible Fish
Cornell-Dubilier Electronics Superfund Site OU4
South Plainfield, New Jersey

Chemical	All Downstream Data [1]		All Reference Data [2]		USEPA Regional Screening Level for Fish Consumption [3]		Preliminary COPC? [Y/N] [4]
	Frequency of Detection	Range of Detected Concentrations [5] mg/kg	Frequency of Detection	Range of Detected Concentrations [5] mg/kg	mg/kg	basis	
Polychlorinated Biphenyls/Pesticides							
Aroclor 1248	85 / 85	0.02 - 10	17 / 17	0.02 - 1.5	0.00158	c	Y
Aroclor 1254	85 / 85	0.096 - 42	17 / 17	0.07 - 6.3	0.00158	c	Y
alpha-Chlordane	13 / 85	0.02 - 0.3	10 / 17	0.01 - 2.5	0.00901	c	Y
gamma-Chlordane	8 / 85	0.01 - 0.2	10 / 17	0.005 - 1.6	0.00901	c	Y
4,4'-DDD	10 / 85	0.004 - 0.2	8 / 17	0.002 - 0.1	0.0131	c	Y
4,4'-DDE	66 / 85	0.004 - 0.3	16 / 17	0.004 - 0.11	0.00928	c	Y
Endrin	1 / 85	0.04 - 0.04	0 / 17	ND	0.0406	n	N
Endrin aldehyde	8 / 85	0.005 - 0.1	0 / 17	ND	NA		Y
Heptachlor epoxide	42 / 85	0.003 - 0.1	11 / 17	0.001 - 0.05	0.000347	c	Y
Methoxychlor	1 / 85	0.004 - 0.004	0 / 17	ND	0.676	n	N
Metals							
Aluminum	73 / 85	2.6 - 250	17 / 17	2.7 - 11	135	n	Y
Arsenic	4 / 85	0.1 - 0.2	1 / 17	0.2 - 0.2	0.0021	c	Y
Barium	45 / 85	0.11 - 0.7	8 / 17	0.17 - 2.2	27	n	N
Cadmium	1 / 85	0.2 - 0.2	0 / 17	ND	0.135	n	Y
Calcium*	85 / 85	89 - 6,800	17 / 17	155 - 4,800	NA		N
Chromium	64 / 85	0.21 - 2.7	12 / 17	0.27 - 0.7	203	n	N
Cobalt	4 / 85	0.3 - 0.4	2 / 17	0.3 - 0.4	0.0406	n	Y
Copper	84 / 85	0.22 - 8.1	16 / 17	0.23 - 3.6	5.41	n	Y
Iron	85 / 85	3.2 - 19	17 / 17	2.6 - 25	94.6	n	N
Lead	6 / 85	0.12 - 0.3	3 / 17	0.2 - 0.2	NA		Y
Magnesium*	85 / 85	130 - 310	17 / 17	230 - 310	NA		N
Manganese	84 / 85	0.14 - 3.3	14 / 17	0.1 - 4.1	18.9	n	N
Mercury	77 / 85	0 - 0.4	14 / 17	0.04 - 0.2	0.0135**	n	Y
Nickel	8 / 85	0.6 - 1.4	1 / 17	1.8 - 1.8	2.7	n	N
Potassium*	85 / 85	2,000 - 4,000	17 / 17	2,800 - 3,900	NA		N
Selenium	82 / 85	0.1 - 1.1	16 / 17	0.2 - 0.4	0.676	n	Y
Silver	4 / 85	0.3 - 0.4	0 / 17	ND	0.676	n	N
Sodium*	85 / 85	240 - 650	17 / 17	270 - 550	NA		N
Vanadium	4 / 85	0.3 - 0.5	2 / 17	0.4 - 0.4	0.681	n	N
Zinc	85 / 85	4 - 22	17 / 17	6.6 - 25	40.6	n	N

Notes

1 = Downstream data are from locations A1 to A7 (Phase II) and A11 to A13 (Phase III) from the 1999 Ecological Evaluation (USEPA, 1999).

2 = Reference data are from locations A9 (Phase II) and A10 (Phase III) from the 1999 Ecological Evaluation (USEPA, 1999).

3 = USEPA Regional Screening Levels (RSL) protective of fish consumption were obtained from the RSL calculator accessed online at http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search.

c = RSL is based on a target cancer risk of 1E-06.

n = RSL is based on potential for adverse, non-cancer health effects. Screening levels based on non-cancer health effects were reduced by 1/10 to represent a target hazard quotient of 0.1.

** For methylmercury

4 = Chemicals are identified as preliminary COPCs where the maximum detected concentration in All Downstream Data is greater than the corresponding RSL or where no RSL is available, except for the essential nutrients (i.e., calcium, magnesium, potassium, and sodium), which are categorically eliminated as COPCs.

5 = Concentrations in filets from bullheads, carp, largemouth bass, sunfish, and white suckers.

* Essential nutrient

NA = Not Available

ND = Not detected

TABLE 3-10
Summary of Preliminary Chemicals of Potential Concern (COPC) and Potential Ecological Concern (COPEC)
Cornell-Dubilier Electronics Superfund Site OU4
South Plainfield, New Jersey

	OU4						OU2	OU3
COPC	Floodplain Soil	Sediment	Surface Water	Edible Fish	1999 Ecological Evaluation [1]	2010 Reassessment [2]	Soil [3, 4]	Groundwater [5]
Volatile Organic Compounds								
Acetone		E						
Benzene							H	H
n-Butylbenzene		H, E						
Carbon disulfide		E						
Chlorobenzene								H
Chloroethane (ethyl chloride)		E						
Chloroform								H
Chloromethane		E						
1,3-Dichlorobenzene								H
1,4-Dichlorobenzene								H
1,1-Dichloroethene							H, E	H
cis-1,2-Dichloroethene								H
trans-1,2-Dichloroethene								H
2,2-Dichloropropane								H
Ethylbenzene							E	
2-Hexanone		H						H
p-Isopropyltoluene		H, E						
Methylene chloride							E	
Methyl tert butyl ether		E	E					H
Toluene		E						
1,1,2,2-Tetrachloroethane			H					
Tetrachloroethene							H, E	H
Toluene							E	
1,2,3-Trichlorobenzene		H, E						H
1,2,4-Trichlorobenzene								H
1,1,2-Trichloroethane								H
Trichloroethene			H				H, E	H
Vinyl chloride							H, E	H
Xylenes							E	
Semi-Volatile Organic Compounds								
Acenaphthene					benthos		E	
Acenaphthylene	H	H, E			benthos			
Acetophenone	H							
Anthracene		E			benthos		E	
Benzidine	E	H, E						
Benzo(a)anthracene	H, E	H, E			benthos		H, E	
Benzo(a)pyrene	H, E	H, E			benthos		H, E	
Benzo(b)fluoranthene	H	H, E			benthos		H, E	
Benzo(g,h,i)perylene	H	H, E			benthos		E	
Benzo(k)fluoranthene	H	H, E					H, E	
Benzoic acid	E	E						
bis(2-Chloroisopropyl)ether	E							
Butylbenzylphtalate	E				benthos			
Chrysene	E	E			benthos		H, E	
Semi-Volatile Organic Compounds								
Dibenz(a,h)anthracene	H	H, E					H, E	
Dibenzofuran	H, E						E	
Diethylphthalate	E							
Dimethylphthalate	H							
2,6-Dinitrotoluene		E						
bis(2-Ethylhexyl)phthalate		H	E		benthos			
Fluoranthene		E			benthos		E	
Fluorene		E			benthos		E	
Hexachlorobenzene	E							
Hexachlorobutadiene								H
Indeno(1,2,3-cd)pyrene	H	H, E			benthos		H, E	
2-Methylnaphthalene							E	
3 & 4 Methylphenol		H, E			benthos			
Naphthalene	E				benthos		E	H
di-n-Octylphthalate	H	H, E						
Phenanthrene	H	H, E			benthos		E	
Pyrene		E			benthos		E	
Polychlorinated Biphenyls/Dioxins/Pesticides								
Aroclor 1232								H
Aroclor 1242							H	
Aroclor 1248				H			H, E	
Aroclor 1254	H, E	H, E		H			H, E	H
Arolcor 1260							E	
Dioxin-like PCB congeners						birds, mammals	H, E	
Nondioxin-like PCB congeners								
Total PCBs					benthos, fish, birds, mammals	fish, birds, mammals	H	
2,3,7,8-TCDD TEQ							H, E	H
Aldrin							H, E	H
alpha-BHC							H, E	
delta-BHC								H
alpha-Chlordane				H	birds		E	
gamma-Chlordane				H	birds		H	
4,4'-DDD		E		H	benthos, birds		E	
4,4'-DDE	E			H	birds		H, E	
4,4'-DDT					birds		H, E	
Dieldrin		H, E			benthos		H, E	
Endosulfan sulfate							E	
Endrin aldehyde				H	birds		H, E	
Heptachlor	E						H, E	
Heptachlor epoxide				H			H, E	
Methoxychlor					mammals			
Toxaphene							E	
Metals								
Aluminum	H, E	H		H			E	
Antimony	H, E	H, E					E	
Arsenic	H, E	H, E		H	benthos, mammals		H	H
Barium	E	E	E				E	H
Beryllium		E						
Cadmium	H, E	H, E		H	benthos		E	
Chromium	E	E			benthos		E	H
Cobalt	H, E	H, E		H			E	H
Copper	H, E	E		H	benthos		E	
Iron	H, E	H, E						H
Lead	H, E	E	E	H	benthos, birds		E	
Manganese	H, E	H, E	H, E		benthos			H
Mercury	H, E	E		H	benthos, mammals		E	H
Nickel	E	E			benthos		E	
Selenium	E	E		H	fish, mammals		E	
Silver	E	E			benthos		E	
Thallium	H, E						E	
Vanadium	H, E	H, E					E	
Zinc	E	E			benthos		E	

Notes
1 = Chemical found to "contribute significantly" to site risks in the 1999 Ecological Evalaution for the listed receptors (USEPA, 1999).
2 = Chemical with modeled hazard index > 1 in the 2010 Reassessment for the listed receptors (USEPA, 2010).
3 = Chemical found to "contribute significantly" to site risks in the Baseline Human Health Risk Assessment conducted in support of the Final Remedial Investigation Report for Operable Uni 2 (OU-2) Facility Soils and Buildings, defined as "COPCs that individually contributed a carcinogenic risk greater than 1E-06 when the pathway exceeded 1E-04 or had a HQ [hazard quotient] greater than 1.0 when the HI [hazard index] exceeded 1.0 for a given population" (Appendix I, Tables 10.1 to 10.20; Foster Wheeler Environmental Corporation, 2002).
4 = Chemical identified as a COPEC for terrestrial plants and soil invertebrates and microbial processes in the Screening-Level Ecological Risk Assessment based on the maximum detectec concentrations and/or found to exceed a no-observable adverse effect level (NOAEL) based HQ of 1.0 for one or more representative wildlife species (i.e., short-tailed shrew, red fox, American robin, red-tailed hawk) based on mean concentrations in the Baseline Ecological Risk Assessment conducted in support of the Final Remedial Investigation Report for Operab Unit 2 (OU-2) Facility Soils and Buildings (Section 7; Foster Wheeler Environmental Corporation, 2002).
5 = Chemical identified as a preliminary COPC in the Final Remedial Investigation/Feasibility Study Work Plan Operable Unit 3: Groundwater (Table 3-1, Malcolm Pirnie, Inc., 2008).
H = Preliminary COPC for human health
E = Preliminary COPEC for ecological health

TABLE 3-11
HUMAN HEALTH CONCEPTUAL SITE MODEL FOR BOUND BROOK
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Currrent/Future	Surface Water	Surface Water	Bound Brook	Recreationist	Adult	Indicental Ingestion	Quant	Surface water could be contacted while wading or otherwise recreating in and along Bound Brook.
						Dermal Contact	Quant	
						Inhalation	Qual	
					Adolescent	Indicental Ingestion	Quant	
						Dermal Contact	Quant	
						Inhalation	Qual	
				Culvert/Spillway Worker	Audlt	Incidental Ingestion	Qual	Surface water could be contacted while maintaing and/or cleaning culverts, spillways, and other structures in and along Bound Brook.
						Dermal Contact	Quant	
						Inhalation	Qual	
				Angler	Adult	Incidental Ingestion	Qual	Surface water could be contacted while fishing in or along Bound Brook.
						Dermal Contact	Quant	
						Inhalation	Qual	
	Sediment	Sediment	Bound Brook	Recreationist	Adult	Incidental Ingestion	Quant	Sediment could be contacted while wading or otherwise recreating in and along Bound Brook.
						Dermal Contact	Quant	
						Inhalation	Qual	
					Adolescent	Incidental Ingestion	Quant	
						Dermal Contact	Quant	
						Inhalation	Qual	
				Culvert/Spillway Worker	Audlt	Incidental Ingestion	Quant	Sediment could be contacted while maintaing and/or cleaning culverts, spillways, and other structures in and along Bound Brook.
						Dermal Contact	Quant	
						Inhalation	Qual	
				Angler	Adult	Incidental Ingestion	Quant	Sediment could be contacted while fishing in or along Bound Brook.
						Dermal Contact	Quant	
						Inhalation	Qual	
	Bank Soil/Sediment	Bank Soil/Sediment	Bound Brook	Recreationist	Adult	Incidental Ingestion	Quant	Bank soil/sediment could be contacted while wading or otherwise recreating in and along Bound Brook.
						Dermal Contact	Quant	
						Inhalation	Qual	
					Adolescent	Incidental Ingestion	Quant	
						Dermal Contact	Quant	
						Inhalation	Qual	
				Angler	Adult	Incidental Ingestion	Quant	Bank soil/sediment could be contacted while fishing in or along Bound Brook.
						Inhalation	Qual	
				Culvert/Spillway Worker	Audlt	Incidental Ingestion	Quant	Bank soil/sediment could be contacted while maintaing and/or cleaning culverts, spillways, and other structures in and along Bound Brook.
						Dermal Contact	Quant	
						Inhalation	Qual	
	Floodplain Soil	Floodplain Soil	Adjacent to Bound Brook	Resident	Adult	Incidental Ingestion	Quant	Floodplain soil could be contacted while recreating in floodplain areas adjacent to Bound Brook
						Dermal Contact	Quant	
						Inhalation	Quant	
					Child	Incidental Ingestion	Quant	
						Dermal Contact	Quant	
						Inhalation	Quant	
				Commercial/Industrial Worker	Adult	Incidental Ingestion	Quant	Floodplain soil could be contacted while working in floodplain areas adjacent to Bound Brook
						Dermal Contact	Quant	
						Inhalation	Quant	
				Construction/Utility Worker	Adult	Incidental Ingestion	Quant	Floodplain soil could be contacted while working in floodplain areas adjacent to Bound Brook
						Dermal Contact	Quant	
						Inhalation	Quant	
	Biota	Fish	Bound Brook and Tributaries	Angler/Sportsman	Adult	Ingestion	Quant	Locally-caught fish could be consumed.
					Child	Ingestion	Quant	
		Other Biota	Bound Brook and Tributaries	Angler/Sportsman	Adult	Ingestion	Qual/Quant	The possibility that other biota (i.e., crayfish, frogs, turtles) are caught locally and consumed will be investigated.
					Child	Ingestion	Qual/Quant	

TABLE 5-1
Preliminary OU4 Exposure Units for the Baseline Human Health Risk Assessment
Cornell-Dubilier Electronics Superfund Site OU4
South Plainfield, New Jersey

Exposure Medium/Unit	Exposure Unit Name	Approximate Mile Point Segment or Location	Corresponding Existing Data to be Considered						New Data During RI
			1999 Ecological Evaluation Sampling Locations	1997 Sampling Program Transects	1999 Soil/Sediment Sampling Program Locations	2007/2008 Sampling Program Transects	2008 Conrail Sampling Program Locations	2008 Biological Sampling Program Locations	
Sediment & Surface Water									
Adjacent to former CDE facility	EU-BB1	6.7 - 6.1	AQ1	A - ZZ		A - RR			Low resolution sediment core and surface water samples
Downstream of former CDE facility	EU-BB2	6.1 - 5.2	AQ2	AAA - WWW					
Downstream of former CDE facility to New Market Pond	EU-BB3	5.2 - 4.1	AQ3 - AQ5	XXX - VVVV					
New Market Pond (to spillway)	EU-BB4	4.1 - 3.4	AQ6						
Downstream of New Market Pond to Green Brook	EU-BB5	3.4 - 0.0	AQ7, AQ11 - AQ13						
Spring Lake	EU-SL	--	AQ10, AQ10-1, AQ10-2						
Cedar Brook	EU-CB	--			A2-18 - A2-21				
Floodplain Soil									
Historic Area 1	EU-FPS1	Veteran's Memorial Park			A1-01 -A1-18, A1-20 - A1-32, A1-34				
Historic Area 2	EU-FPS2	North side of Cedar Brook between Louden and Oakmoor Avenues			A2-01 - A2-11, A2-13 - A2-17				
Historic Area 3	EU-FPS3	North side of Bound Brrok near Fred Allen Drive			A3-01, A3-03 - A3-23, A3-15 - A3-28				
Historic Area 4	EU-FPS4	South of New Market Avenue/East of Highland Avenue			A4-01 - A4-08, A4-10 - A4-21				
Bound Brook/Cedar Brook confluence	EU-FPS5	Between historic Areas 2 and 3 on the north bank of Bound Brook and south of historic Areas 1 to 3 on the south bank of Bound Brook							Soil samples
Former CDE Facility	EU-FPS6	Northeast of the former CDE faciltiy in the marshy area on the south bank of Bound Brook					B53X4, B53X5, B53Y2, B5405, B5408, B5419, B5421, B5426, B5431, B5432, B5446, B5447		Soil samples
Edible Fish									
Bound Brook (from adjacent to former CDE facility to Green Brook, including New Market Pond)	EU-BBF	6.7 - 0.0	A1 - A6, A11 - A13					2 - 6	
Spring Lake	EU-SLF	--	A10					7	

TABLE 5-2
Summary of Potential Mammalian Toxicity Reference Values (TRVs)
Cornell-Dubilier Electronics Superfund Site OU4
South Plainfield, New Jersey

COPEC	NOAEL mg/kg/d	LOAEL mg/kg/d	Test Species	Reference
Semi-Volatile Organic Compounds				
Benzo(a)pyrene	1	10	mouse	Sample et al., 1996
Dibenzofuran	NA	NA		
Low Molecular Weight PAHs	65.6	328	various	USEPA, 2007 [a]
High Molecular Weight PAHs	0.615	3.07	various	USEPA, 2007 [a]
Polychlorinated Biphenyls				
Total PCBs	0.034	0.069	mink	Restrum et al., 1998
Pesticides				
Aldrin	0.2	1	rat	Sample et al., 1996
BHC (mixed isomers)	0.014	0.14	mink	Sample et al., 1996
Chlordane	4.6	9.2	mouse	Sample et al., 1996
DDT & metabolites	0.147	0.735	various	USEPA, 2007 [a]
Dieldrin	0.015	0.03	various	USEPA, 2007 [a]
Endosulfan sulfate	NA	NA		
Endrin	0.092	0.92	mouse	Sample et al., 1996
Heptachlor	0.1	1	mink	Sample et al., 1996
Heptachlor epoxide	NA	NA		
Methoxychlor	4	8	rat	Sample et al., 1996
Toxaphene	NA	NA		
Metals				
Aluminum	1.93	19.3	mouse	Sample et al., 1996
Antimony	0.059	0.59	various	USEPA, 2005 [a]
Arsenic	1.04	1.66	various	USEPA, 2005 [a]
Barium	51.8	88	various	USEPA, 2005 [b]
Beryllium	0.532	0.67	various	USEPA, 2005 [b]
Cadmium	0.77	7.7	various	USEPA, 2005 [a]
Chromium	2.4	58	various	USEPA, 2008 [b]
Cobalt	7.33	20.8	various	USEPA, 2005 [b]
Copper	5.6	9.34	various	USEPA, 2007 [a]
Iron	NA	NA		
Lead	4.7	8.9	various	USEPA, 2005 [a]
Manganese	51.5	146	various	USEPA, 2007 [b]
Mercury (mercuric chloride)	1	NA	mink	Sample et al., 1996
Methyl mercury	0.015	0.025	mink / rat	Sample et al., 1996
Nickel	1.7	3.4	various	USEPA, 2007 [a]
Selenium	0.143	0.215	various	USEPA, 2007 [a]
Silver	6.02	60.2	various	USEPA, 2006 [c]
Thallium	0.0074	0.074	rat	Sample et al., 1996
Vanadium	4.16	8.31	rat	USEPA, 2005 [a]
Zinc	75.4	298	rat	USEPA, 2007 [b]

Notes
a = LOAEL is from the same study as the NOAEL
b = LOAEL is equal to the geometric mean of LOAELs for reproduction and growth
c = LOAEL is equal to the lowest LOAEL for reproduction and growth
NA = Not Available

TABLE 5-2
Summary of Potential Avian Toxicity Reference Values (TRVs)
Cornell-Dubilier Electronics Superfund Site OU4
South Plainfield, New Jersey

COPEC	NOAEL mg/kg/d	LOAEL mg/kg/d	Test Species	Reference
Semi-Volatile Organic Compounds				
Benzo(a)pyrene	NA	NA		
Dibenzofuran	NA	NA		
Low Molecular Weight PAHs	NA	NA		
High Molecular Weight PAHs	NA	NA		
Polychlorinated Biphenyls				
Total PCBs	0.11	1.1	ring dove	Peakall and Peakall, 1973
Pesticides				
Aldrin	NA	NA		
alpha-BHC	0.56	2.25	Japanese quail	Sample et al., 1996
Chlordane	2.14	10.7	redwinged blackbird	Sample et al., 1996
DDT & metabolites	0.227	2.27	various	USEPA, 2007 [a]
Dieldrin	0.077	NA	barn owl	Sample et al., 1996
Endosulfan sulfate	NA	NA		
Endrin	0.01	0.1	screech owl	Sample et al., 1996
Heptachlor	NA	NA		
Heptachlor epoxide	NA	NA		
Methoxychlor	NA	NA		
Toxaphene	NA	NA		
Metals				
Aluminum	109.7	44.5	ringed dove/day-old white leghorn chicks	Sample et al., 1996
Antimony	NA	NA		
Arsenic	2.24	4.5	various	USEPA, 2005 [b]
Barium	20.8	41.7	day-old chicks	Sample et al., 1996
Beryllium	NA	NA		
Cadmium	1.47	6.35	various	USEPA, 2005 [b]
Chromium	2.66	14.3	various	USEPA, 2007 [b]
Cobalt	7.61	18.3	various	USEPA, 2005 [b]
Copper	4.05	12.1	various	USEPA, 2007 [a]
Iron	NA	NA		
Lead	1.63	3.26	various	USEPA, 2005 [a]
Manganese	179	377	various	USEPA, 2007 [b]
Mercury (mercuric chloride)	0.45	0.9	Japanese quail	Sample et al., 1996
Methyl mercury	0.0064	0.064	mallard duck	Sample et al., 1996
Nickel	6.71	18.6	various	USEPA, 2007 [b]
Selenium	0.29	0.579	various	USEPA, 2007 [a]
Silver	2.02	20.2	various	USEPA, 2006 [c]
Thallium	NA	NA		
Vanadium	0.344	0.688	various	USEPA, 2005 [a]
Zinc	66.1	171	various	USEPA, 2007 [b]

Notes

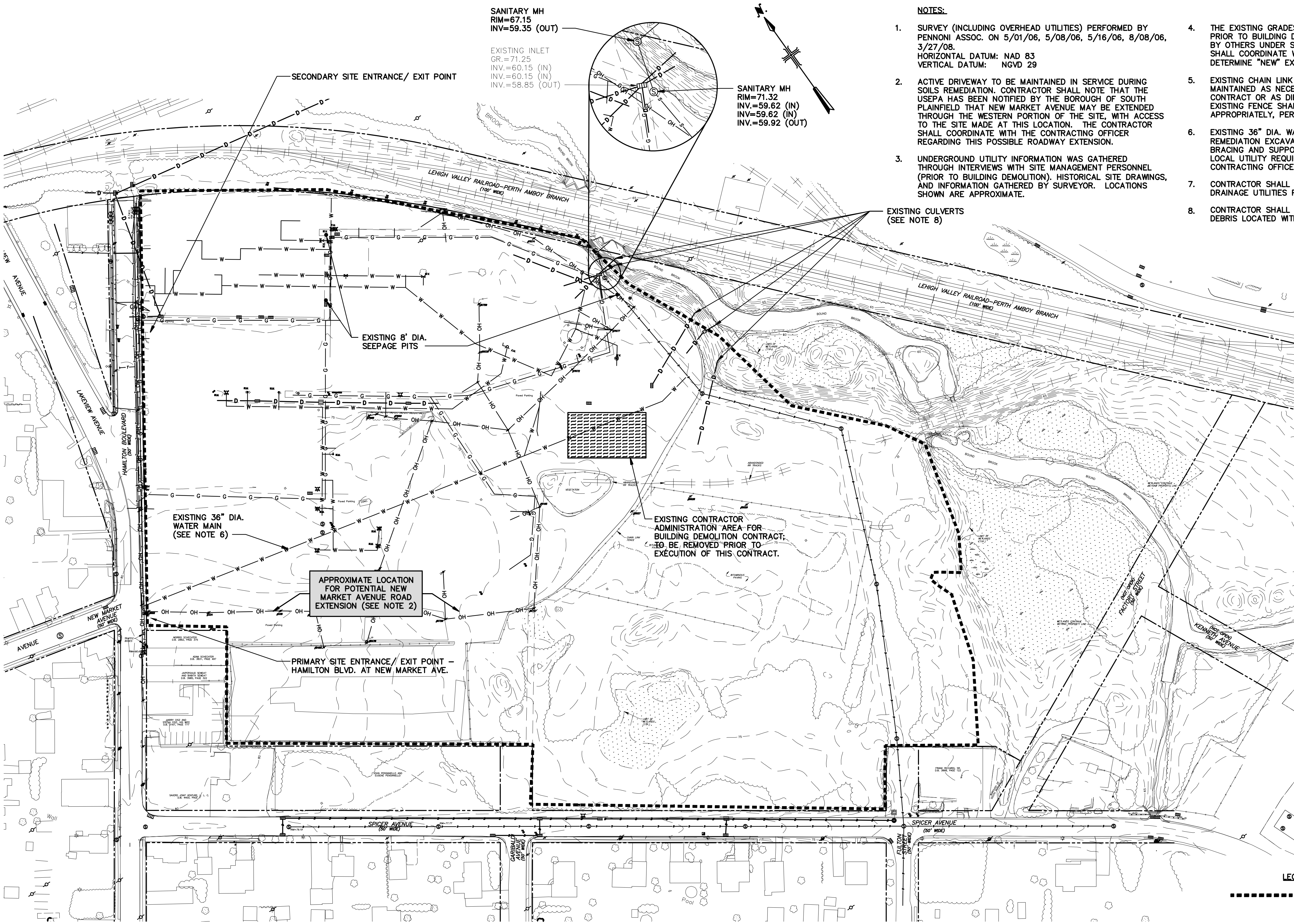
a = LOAEL is from the same study as the NOAEL

b = LOAEL is equal to the geometric mean of LOAELs for reproduction and growth

c = LOAEL is equal to the lowest LOAEL for reproduction and growth

NA = Not Available

Attachment 1



NOTES:

1. SURVEY (INCLUDING OVERHEAD UTILITIES) PERFORMED BY PENNONI ASSOC. ON 5/01/06, 5/08/06, 5/16/06, 8/08/06, 3/27/08.
   HORIZONTAL DATUM: NAD 83
   VERTICAL DATUM: NGVD 29
2. ACTIVE DRIVEWAY TO BE MAINTAINED IN SERVICE DURING SOILS REMEDIATION. CONTRACTOR SHALL NOTE THAT THE USEPA HAS BEEN NOTIFIED BY THE BOROUGH OF SOUTH PLAINFIELD THAT NEW MARKET AVENUE MAY BE EXTENDED THROUGH THE WESTERN PORTION OF THE SITE, WITH ACCESS TO THE SITE MADE AT THIS LOCATION. THE CONTRACTOR SHALL COORDINATE WITH THE CONTRACTING OFFICER REGARDING THIS POSSIBLE ROADWAY EXTENSION.
3. UNDERGROUND UTILITY INFORMATION WAS GATHERED THROUGH INTERVIEWS WITH SITE MANAGEMENT PERSONNEL (PRIOR TO BUILDING DEMOLITION). HISTORICAL SITE DRAWINGS, AND INFORMATION GATHERED BY SURVEYOR. LOCATIONS SHOWN ARE APPROXIMATE.
4. THE EXISTING GRADES SHOWN REPRESENT SITE CONDITIONS PRIOR TO BUILDING DEMOLITION WHICH HAS BEEN COMPLETED BY OTHERS UNDER SEPARATE CONTRACT. CONTRACTOR SHALL COORDINATE WITH CONTRACTING OFFICER TO DETERMINE "NEW" EXISTING CONDITIONS.
5. EXISTING CHAIN LINK FENCE AND GATES SHALL BE MAINTAINED AS NECESSARY UNTIL COMPLETION OF THE CONTRACT OR AS DIRECTED BY THE CONTRACTING OFFICER. EXISTING FENCE SHALL BE REMOVED AND DISPOSED OFFSITE APPROPRIATELY, PER CONTRACTING OFFICER DECISION.
6. EXISTING 36" DIA. WATER MAIN SHALL BE PROTECTED DURING REMEDIATION EXCAVATION ACTIVITIES. ALL PROPOSED BRACING AND SUPPORTS SHALL BE IN ACCORDANCE WITH LOCAL UTILITY REQUIREMENTS, AND APPROVED BY CONTRACTING OFFICER.
7. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING ON-SITE DRAINAGE UTILITIES PRIOR TO STARTING WORK.
8. CONTRACTOR SHALL CLEAR AND DISPOSE OFF-SITE ANY DEBRIS LOCATED WITHIN EXISTING BOUND BROOK CULVERTS.

LEGEND:

OU2 BOUNDARY

0 40 80 160
SCALE: 1" = 80'
Verify Scale
bar is one inch on original drawing.
0 1"

U.S. Army Corps of Engineers
KANSAS CITY DISTRICT

Symbol	Description	Date	Approved
	Revisions		

JEFFREY R. BENNETT
PROFESSIONAL ENGINEER
NJ LICENSE 24GE03690800
DATE: JUNE 27, 2008

Designed by: JR	Date: X	Approved by: JRB Date: X
Drawn by: MW	Date: X	File Name: G03-4553G003
Reviewed by: EAD	Date: X	

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
KANSAS CITY DISTRICT
KANSAS CITY, MISSOURI

MALCOLM PIRNIE
MALCOLM PIRNIE, INC.
104 CORPORATE PARK DRIVE
WHITE PLAINS, NEW YORK 10602

CORNELL-DUBILIER ELECTRONICS
SUPERFUND SITE OU-2 SOILS REMEDIATION
SOUTH PLAINFIELD, NEW JERSEY

EXISTING SITE PLAN

G-03

Sheet 3 of 20

XREFS: F:\Projects\4553033\CADD\SOILS REMEDIATION\XREF\WATER-TOWER.dwg F:\Projects\4553033\CADD\SOILS REMEDIATION\XREF\TITLEBLOCK-SOIL.dwg F:\Projects\4553033\CADD\SOILS REMEDIATION\XREF\4553GSP.dwg IMAGES: None
User: WELSHANS Spec: PIRNIE STANDARD File: F:\Projects\4553033\CADD\SOILS REMEDIATION\GEN\G03-4553G003.DWG Scale: 1:1 Date: 06/25/2008 Time: 07:23 Layout: Layout1

Attachment 2

ANGLER/SPORTSMAN SURVEY CHECKLIST

Surveyor:	Location:	Date:	Time:

ALL INFORMATION OBTAINED IN THIS SURVEY WILL REMAIN CONFIDENTIAL

The following questions concern consumption of fish and other species caught in **Spring Lake, Bound Brook and New Market Pond**, and will be used to help assess potential health risks to anglers/sportsmen and their families who consume fish from these waters.

- Have you already taken this survey? YES NO (If Yes, stop)
- What species do you catch?
- Do you also catch species other than fish (crayfish, turtles, frogs, etc)?
- Do you keep any of your catch? YES NO (If No, stop)
- Do you consume any of your catch? YES NO (If No, stop)
- How many people are in your household?
  ( ) Adults (> 18 yrs old)
  ( ) Children (< 18 yrs old)
- How many people in your household consume your catch?
  ( ) Adults (> 18 yrs old)
  ( ) Children (< 18 yrs old)
- Is any of your catch given to anyone outside of your household? YES NO
- How often do you and your family consume fish caught here?
- How many fish do you typically consume in one meal?
- What parts of the fish do you consume?
- How do you usually prepare and cook fish caught here?
- Have you seen posted warnings not to consume fish caught here? YES NO